



Trends in bariatric surgery in Medicare beneficiaries

Trends in Bariatric Surgery

Data Points # 17

Obesity has been associated with a number of comorbidities and adverse health outcomes and is considered one of the major challenges facing the health care system today.¹ In 2008, more than one-third of the adult population was obese,² defined as having a body mass index (BMI) of 30 kg/m² or higher. Research has shown surgical treatments to be more effective for weight loss than nonsurgical strategies such as diet and exercise or pharmacotherapy.^{3,4}

Bariatric procedures result in weight loss by modifying the size of the stomach (restriction) or the anatomy of the small intestine (malabsorption).³ The most common operation for weight loss performed in the United States, the Roux-en-Y gastric bypass (RYGB), is both a restrictive and a malabsorptive operation. RYGB is performed by creating a small gastric pouch, usually <30 mL, and rerouting the intestine such that the duodenum and proximal jejunum are bypassed. It is most often performed laparoscopically (LRYGB) but can also be carried out with an open approach (ORYGB) when indicated. Another option is the adjustable gastric band (AGB), a purely restrictive approach. It reduces stomach size through the use of a mechanical device placed over the proximal portion of the stomach. Finally, biliopancreatic diversion with duodenal switch (DS), the most malabsorptive operation, bypasses most of the duodenum and all of the jejunum, and provides only about a 100 cm common channel in the distal ileum for both consumed nutrients and biliopancreatic secretions to mix and be absorbed.³

Each operation provides different but significant degrees of weight loss. In addition, studies have demonstrated significant improvements in medical comorbidities such as type 2 diabetes, obstructive sleep apnea, and hypertension following bariatric surgeries.^{5,6} Bariatric surgery is not risk free, however. Morbidity and mortality rates following bariatric surgery continue to be a major concern.⁷



Use of bariatric surgery increased dramatically in Medicare beneficiaries from 2006 through 2009.

Procedure mix varies by age and region and changed over the period of analysis as laparoscopic operations became more common.

Most Medicare bariatric surgery recipients are under age 65 (eligible due to disability), but the proportion of recipients over 65 has increased over time.

Rehospitalization rates are moderate and relatively stable over time. Postoperative mortality is low.

Bariatric surgery is not associated with disenrollment from the Medicare program among working age disabled beneficiaries. Only about one percent of disabled people who received bariatric surgery disenrolled within five years of the procedure.

Medicare provides health insurance to people over age 65 and to working-age disabled people. As observed in the general population, obesity is common in Medicare beneficiaries. In 2002, 21.4 percent of older beneficiaries and 39.3 percent of disabled beneficiaries were considered obese.⁸ These numbers have likely increased over time.⁹ As the number of obese Medicare beneficiaries increases, so does the number eligible for bariatric surgery.

Beginning in February 2006, the Centers for Medicare & Medicaid Services (CMS) expanded coverage of bariatric operations. Beneficiaries with a BMI of 35 kg/m² or greater and at least one obesity-related comorbidity who have documented unsuccessful medical treatment for their obesity become eligible to receive bariatric surgery. Medicare covers ORYGB or LRYGB, open or laparoscopic DS, or laparoscopic adjustable gastric banding in an inpatient (IPLAGB) or outpatient (OPLAGB) setting at a Level 1 Bariatric Surgery Center or Bariatric Surgery Center of Excellence.¹⁰ This report describes the use and associated outcomes of bariatric surgery by Medicare beneficiaries from 2006 through 2009.

METHODS

Cohort

We identified all Medicare beneficiaries, both working-age disabled and age eligible, who received one of five bariatric operations from 2006 through 2009. We defined our operations using CMS Healthcare Common Procedure Coding System (HCPCS) codes in the Carrier data: 43644-43645 for LRYGB; 43845 for laparoscopic DS; 43770 for LAGB, both inpatient and outpatient; and 43846-43847 for ORYGB. Patients must have been enrolled in Medicare Parts A and B at the time of the operation.

Carrier claims must have been matched to an inpatient or outpatient claim and be accompanied by a diagnosis of morbid obesity (278.01) or a reported BMI of at least 35 kg/m² (V85.35-V85.39, V85.4X). More than 95 percent of claims for these procedures were accompanied by these diagnosis codes. Denied claims were excluded.

Analysis

We assessed trends in procedure type across years (2006 to 2009; **Table 1**) and demographic factors, including age, race, sex, and geographic region (West, Southwest, Midwest, Northeast, Southeast). These characteristics were all identified in the beneficiary summary file during the year the operation took place. We further distinguish beneficiaries who are eligible for Medicare due to disability (those less than 64 years of age) or age (65 years and older).

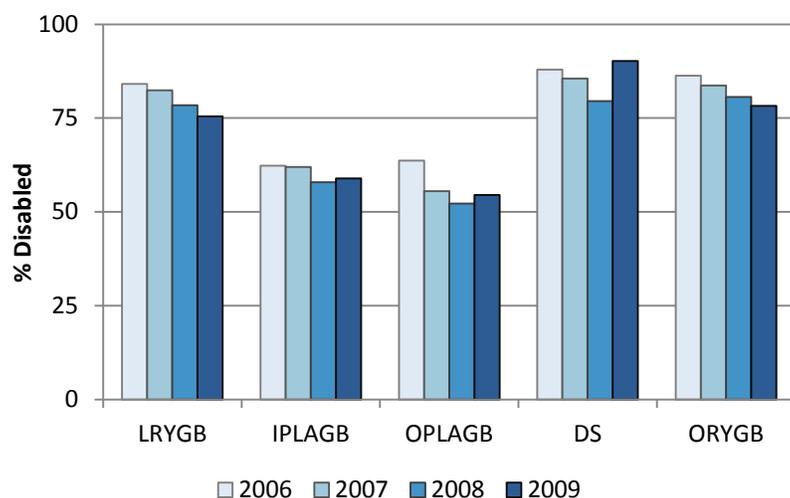
The outcomes we studied included hospital length of stay (LOS), rehospitalization rates, one-year mortality, and disenrollment from Medicare for the disabled beneficiaries. LOS was measured from admission to discharge. Rehospitalization within 30 days was identified as any admission within 30 days from discharge, except in the case of OPLAGB, where rehospitalization was identified as any admission within 30 days of the outpatient operation.

We used Kaplan-Meier survival estimates¹¹ to measure survival following bariatric surgery (censoring at the end of the observation period) and loss of disability benefits among working-age disabled people (censoring when the beneficiary reached age 65, died, or reached the end of our observation period).

Table 1: Number of bariatric operations received by Medicare beneficiaries, 2006-2009

	Total	LRYGB	IPLAGB	OPLAGB	DS	ORYGB
Total	37,799	19,584	13,746	588	399	3,482
2006	5,605	3,140	1,325	55	33	1,052
2007	8,420	4,311	2,952	117	76	964
2008	11,054	5,492	4,431	205	137	789
2009	12,720	6,641	5,038	211	153	677

LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

Figure 1: Proportion of Medicare beneficiaries receiving bariatric surgery who were disabled, by type of surgery, 2006-2009**Table 2:** Percent distribution of patient demographics among Medicare beneficiaries who received bariatric surgery for morbid obesity, by type of surgery, 2006-2009

	Overall	LRYGB	IPLAGB	OPLAGB	DS	ORYGB
Total	100.0	100.0	100.0	100.0	100.0	100.0
Age (years)						
Disabled Beneficiaries						
18 - 34	6.6	8.0	4.1	4.3	11.8	8.1
35 - 44	15.6	18.0	11.1	11.2	18.8	19.8
45 - 54	24.1	27.2	18.8	16.8	29.1	28.7
55 - 64	25.8	26.0	25.5	22.5	25.8	26.1
Older Beneficiaries						
65 - 66	12.0	10.1	15.5	18.0	7.3	8.6
67 - 70	12.1	8.7	18.0	20.6	6.0	7.0
71+	3.8	2.0	6.9	6.6	1.3	1.6
Sex						
Male	25.5	24.1	27.1	24.0	35.6	26.7
Race						
White	81.9	80.7	83.4	84.2	85.5	81.4
Black	14.2	15.0	13.2	14.5	9.0	14.5
Other	3.9	4.4	3.4	1.4	5.5	4.1
Region						
Midwest	27.2	29.6	22.6	18.7	54.9	30.4
Northeast	18.3	16.0	18.6	41.5	9.5	26.5
Southeast	27.1	27.8	27.6	16.0	11.5	24.2
Southwest	12.9	11.3	16.2	13.1	4.0	10.5
West	14.5	15.3	15.0	10.7	20.1	8.4

LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass. Percentages may not add to 100 due to rounding.

RESULTS

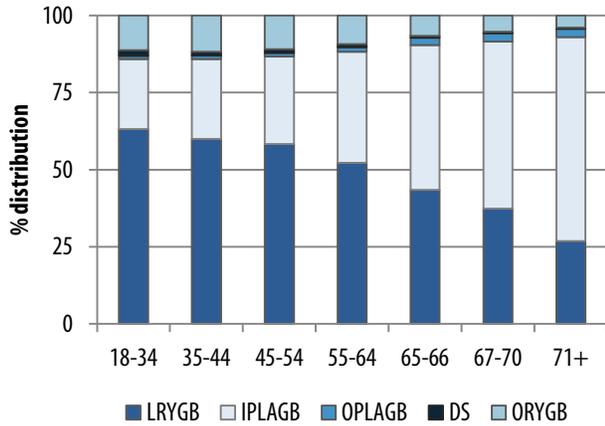
Our analysis of CMS claims resulted in 37,799 Medicare beneficiaries who underwent one of five bariatric operations from 2006 through 2009. The most common procedure was LRYGB (19,584, 51.8%), followed by IPLAGB (13,746, 36.4%), ORYGB (3,482, 9.2%), OPLAGB (588, 1.6%), and DS (399, 1.1%; **Table 1**). Over the period of our study, bariatric surgery more than doubled, from 5,605 cases in 2006 to 12,720 cases in 2009. Use of LRYGB, IPLAGB, OPLAGB, and DS increased over time, while use of ORYGB decreased (**Table 1**). Overall, more whites than any other race/ethnicity received bariatric surgery, and rates of surgery were highest in the Midwest and Southeast regions (**Table 2**).

Bariatric operations were performed on more disabled beneficiaries than older adults, although over time, this majority decreased (**Figure 1**). The youngest patients, ages 18-34, were most likely to undergo LRYGB (63.1%) of any operation. This procedure became less common with each increasing age group, with only 26.8 percent of those over 70 receiving LRYGB. A similar trend was observed with ORYGB and DS (from 11.3% to 4.0% and 1.9% to 0.3%, respectively, across increasing age groups; **Figure 2a**). Alternatively, IPLAGB rates consistently increased as patients aged, from 22.7 percent of operations in the youngest patients to 66.2 percent of those in patients over 70, as did rates of OPLAGB (1.0% to 2.7%; **Figure 2a**).

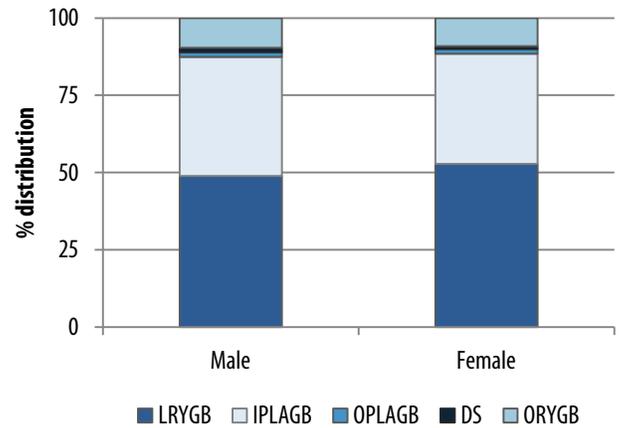
Males and females followed the same patterns in procedure choice: LRYGB was the most common, followed by IPLAGB, ORYGB, OPLAGB, and DS. Females were slightly more likely to undergo LRYGB (52.8%) than males (48.9%; **Figure 2b**).

Figure 2: Distribution of bariatric operations among Medicare disabled and elderly beneficiaries, by age, sex, race/ethnicity, and region, 2006-2009

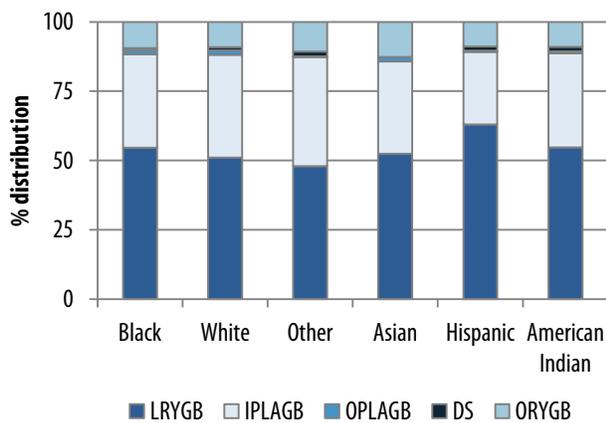
2a: Age (years)



2b: Sex



2c: Race and Ethnicity



2d: Region

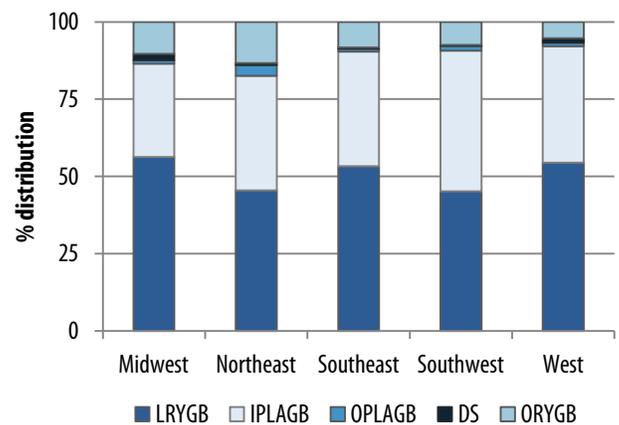


Table 3: Patient outcomes among Medicare beneficiaries receiving bariatric surgery for morbid obesity, by type of surgery, 2006-2009

	Overall	LRYGB	IPLAGB	OPLAGB	DS	ORYGB
Median LOS (Days)	3	3	2	n/a	5	4
	%	%	%	%	%	%
30-day rehospitalization*	8.8	10.4	5.1	3.7*	16.6	15.4
30-day mortality	0.5	0.6	0.2	0.2	0.8	0.2
1-year mortality: Total	1.6	1.7	0.8	0.7	4.0	3.1
1-year mortality: Men	2.1	2.2	1.5	0.7	3.5	4.4
1-year mortality: Women	1.3	1.5	0.6	0.7	4.3	2.5
Disenrollment from Medicare disability benefit within 3 years [†]	0.64	0.69	0.56	0.0	1.2	0.59

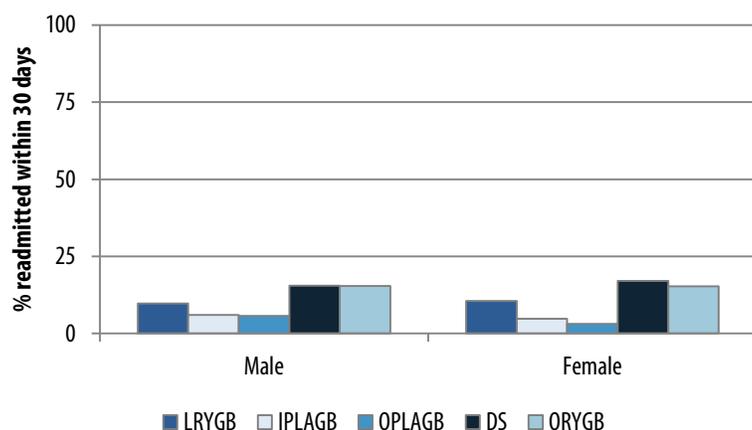
* Hospitalization within 30 days of outpatient operation.

[†] Kaplan-Meier methods used. Observations were censored at beneficiary reaching 65 years of age; December 31, 2010; and death.

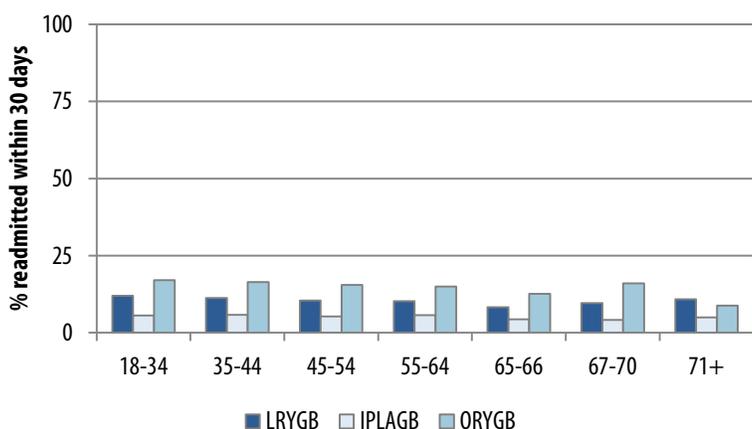
LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

Figure 3: Medicare older and disabled beneficiaries requiring 30-day readmission following bariatric surgery, by type of operation and sex, age, and race, 2006-2009

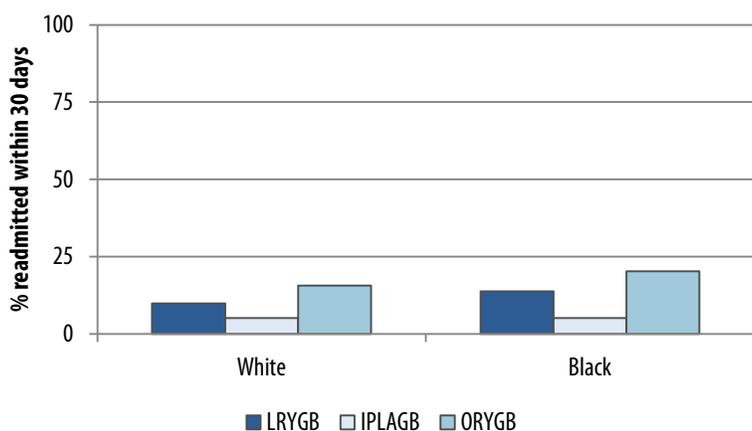
3a: Sex



3b: Age (years)*



3c: Race*



* DS and OPLAGB not reported due to small numbers.

LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

LRYGB was again the most common bariatric procedure performed on patients of all races. It was most common in Hispanic patients, who were less likely than other patients to receive LAGB (Figure 2c).

Geographic Variation

Most Medicare bariatric procedures occurred in the Midwest (27.2%) and Southeast (27.1%) regions, followed by the Northeast (18.3%), West (14.5%), and Southwest (12.9%). Bariatric procedure mix varied by region. LRYGB was most common in all regions (45.2%-56.3% of operations) other than in the Southwest region, where it was as common as IPLAGB. OPLAGB was most common in the Northeast region (3.5%) and least common in the Southeast (0.9%). ORYGB was almost twice as common in the Midwest (10.3%) as the West (5.3%). DS was the least common inpatient procedure, ranging from 0.3 percent of cases in the Southwest to 2.1 percent of cases in the Midwest (Figure 2d).

Outcomes

Overall, median length of stay (LOS) was 3 days, with 8.8 percent being rehospitalized within 30 days (Table 3). Rehospitalization rates did not vary between males (8.8%) and females (8.9%). Both sexes experienced higher (>15%) rehospitalization rates following DS or ORYGB procedures than following LRYGB (9.7-10.6%) or LAGB (3.1-6.0%; Figure 3a). Rehospitalization rates varied more when stratified by age group (Figure 3b) and by race. Black patients were more likely to be rehospitalized within 30 days than whites in total (11.4% vs. 8.6%) and for each procedure (Figure 3c). Mortality was low—0.5 percent at 30 days and 1.6 percent within 1 year (Table 3).

Outcomes differed by operation, with the best outcomes observed in patients undergoing LAGB and the worst in those who had DS (Figure 4). Elderly and disabled beneficiaries had similar survival curves, with 95 percent surviving five years (Figure 5).

Of note, one-year mortality was five times higher for DS patients than for IPLAGB or OPLAGB (4.0% vs. 0.7-0.8%; Table 3 and Figure 6). DS had the worst associated survival, and OPLAGB the best (Figure 6). Outcomes varied slightly over the period of analysis (Figures 7, 8a, and 8b).

Medicare Disenrollment for the Working-Age Disabled

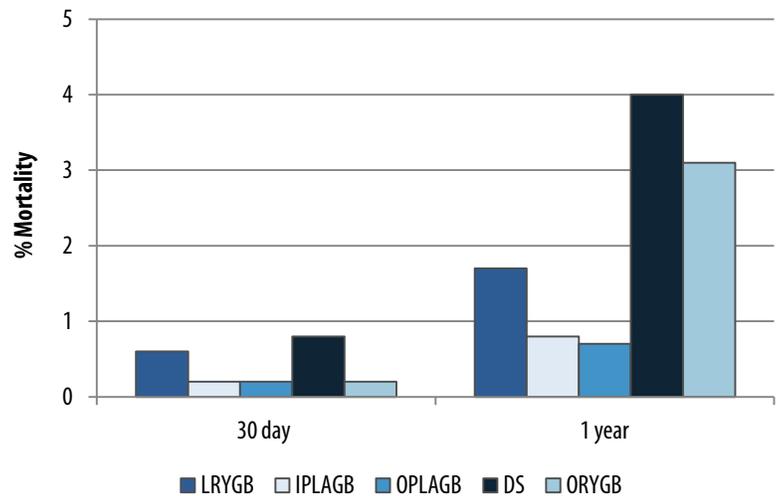
Disenrollment for working-age disabled beneficiaries following bariatric surgery was low; fewer than one percent (0.64%) had disenrolled three years after the operation (Figure 9a). Rates of disenrollment at three years after surgery varied slightly by type of operation (1.2% for DS and 0.69% for LRYGB; Table 3 and Figure 9b).

DISCUSSION

We found that bariatric surgery greatly increased in the Medicare program following reimbursement expansion in February 2006, more than doubling through 2009. Procedure mix varied across patient factors, geography, and time, with laparoscopic operations becoming more common throughout the period studied.

The proportion of patients receiving LRYGB decreased with patient age, and the proportion of elderly Medicare recipients undergoing LAGB increased concomitantly, similar to previously reported findings.¹²

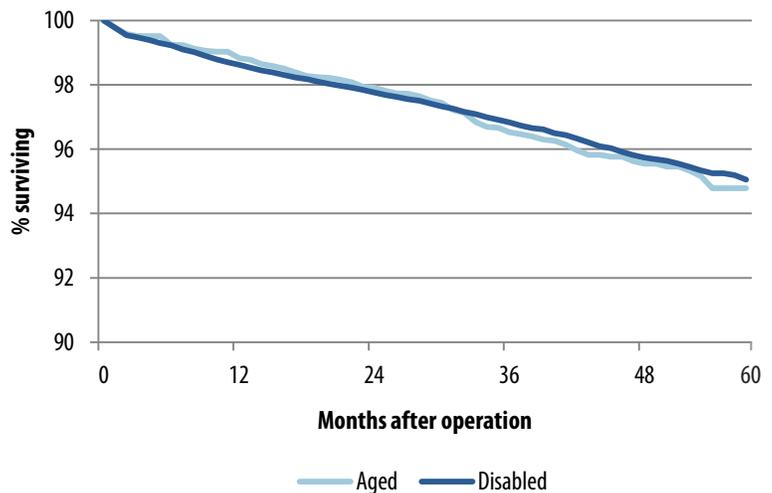
Figure 4: Rate of death following bariatric surgery among Medicare beneficiaries, by type of operation, at 30 days and 1 year, 2006-2009



Note: Figure shown on 0% to 5% scale.

LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

Figure 5: Kaplan-Meier curve describing the survival of Medicare beneficiaries following bariatric surgery, by type of Medicare eligibility, 2006-2009*

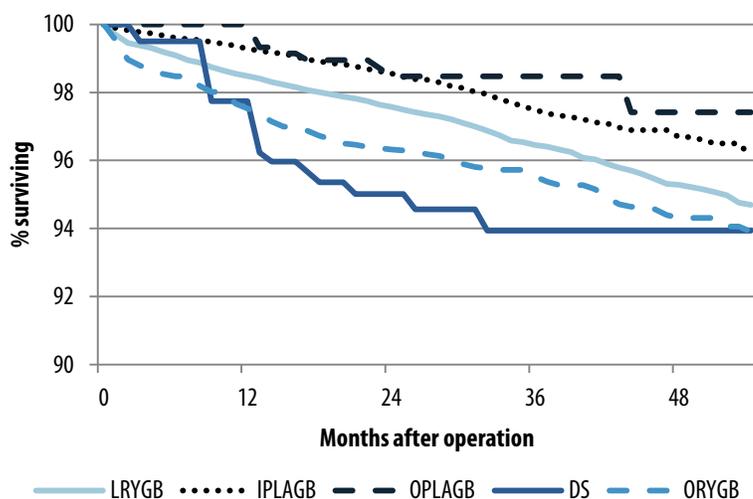


Note: Figure shown on 90% to 100% scale.

* Events censored at the end of the observation period (December 31, 2010).

LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

Figure 6: Kaplan-Meier curve describing the survival of Medicare beneficiaries following bariatric surgery, by type of operation, 2006-2009*

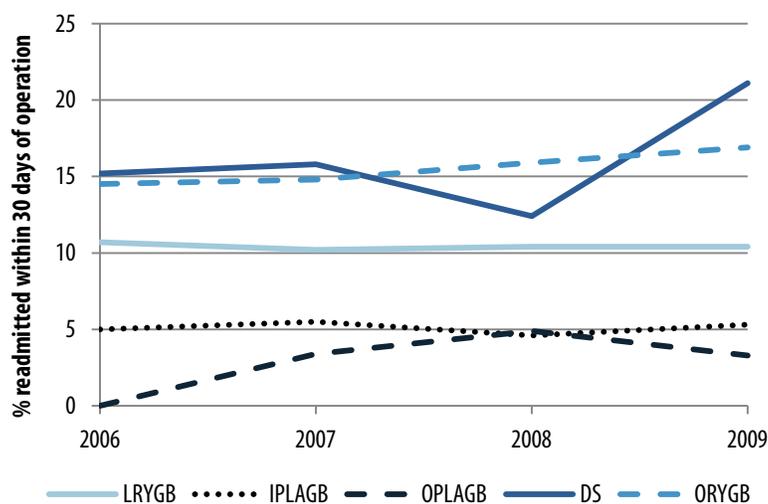


Note: Figure shown on 90% to 100% scale.

* Events censored at the end of the observation period (December 31, 2010).

LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

Figure 7: Rate of Medicare beneficiaries requiring 30-day readmission following bariatric surgery, by type of operation and year, 2006-2009



Note: Figure shown on 0% to 25% scale.

LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

Many surgeons may feel that LAGB is more suitable for older patients because it is comparatively shorter, requires fewer hospital days, and does not require an intestinal anastomosis to be performed. However, we found that older patients receiving RYGB did not require more readmissions than younger patients who underwent the same procedure (Figure 3b).

The geographic differences in procedure mix may be explained by the degree of obesity present in different regions of the country. The Midwest and Southeast regions of the United States have higher rates of obesity compared to the Northeast and Southwest according to the Centers for Disease Control and Prevention¹³; the degree of obesity may vary between these regions as well. Patients with a higher BMI (i.e., ≥ 45 kg/m²) may be more likely to undergo RYGB, because the degree of weight loss experienced will be greater than that achieved by the gastric band.^{14,15}

Observed mortality rates were low: under 1 percent for all operations at 30 days postoperation and 4 percent or less at one year. Prior to the current Medicare coverage rules becoming effective in 2006, David Flum and colleagues investigated bariatric procedure use and related mortality in Medicare beneficiaries between 1997 and 2002.¹⁶ They found higher mortality rates—2.0 percent mortality at 30 days and 4.6 percent mortality at one year. However, due to the years studied, laparoscopic procedures were not included in their analysis. Since then, bariatric surgery has become safer due to a combination of factors that include, but are not limited to, increased use of the laparoscopic approach, achievement of the learning curve as bariatric surgeons have gained more experience, and more regimented fellowship training programs.

Other work since has observed lower mortality rates more similar to what we have reported here.^{7,12,17-19}

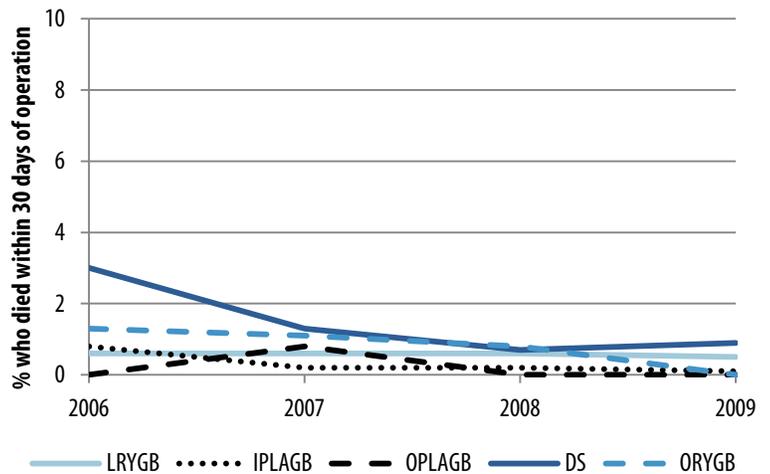
We found that younger disabled beneficiaries received most of the Medicare bariatric operations as was observed in 2001-2002, prior to the 2006 coverage expansion.¹⁷ Among the older Medicare population, we found that a high percentage of bypass recipients were age 65 or 66. This might be interpreted as a sign of pent-up demand for gastric bypass surgeries and suggests that some beneficiaries may be postponing surgery until they become Medicare eligible. Further work is needed to investigate this pattern.

Ideally, bariatric surgery should result in decreased weight-related comorbidities and increased ability to work, thereby reducing the need for disability benefits. Weight-related comorbidities may be preventing some disabled beneficiaries' employment, as these comorbidities are common in bariatric patients. In fact, Doshi and colleagues found that 85 percent of obese disabled beneficiaries had at least one comorbidity.⁸

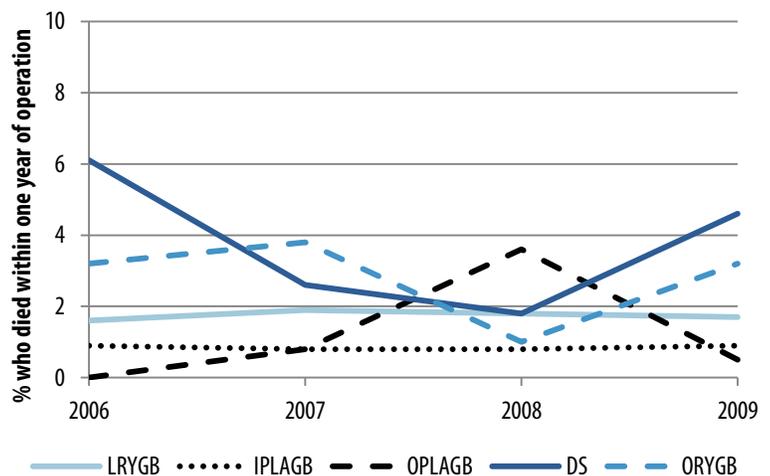
Research has documented decreased comorbidities following bariatric surgery.⁶ One study observed a 51 percent decrease in weight-related comorbidities following bariatric surgery and resolved joint pain in 30 percent of patients. Further, the authors found that weight loss following bariatric surgery increased independence, ability to be active members of society, quality of life, and medical health²⁰ while others observed a decrease in the use of drugs for obesity-related conditions.¹ However, we saw very low disenrollment for Medicare disabled beneficiaries following bariatric surgery; approximately 99 percent of disabled beneficiaries continued to be enrolled in Medicare due to disability five years post-bariatric surgery.

Figure 8: Medicare beneficiaries who died within 30 days and 1 year following bariatric surgery, by type of operation and year, 2006-2009

8a: 30-day mortality



8b: 1-year mortality

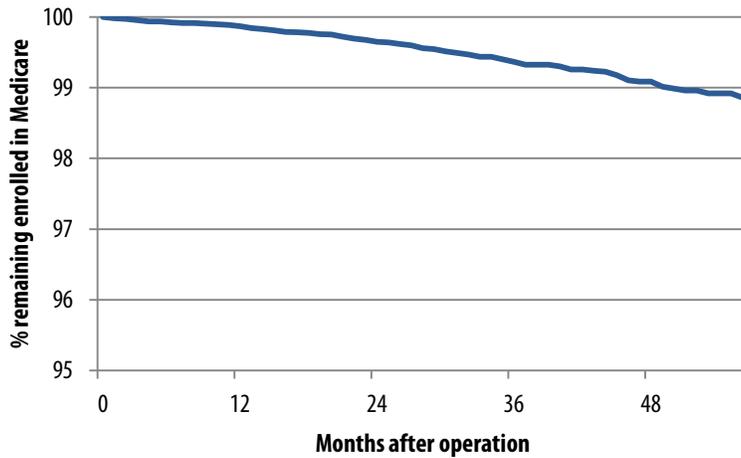


Note: Figures shown on 0% to 10% scale.

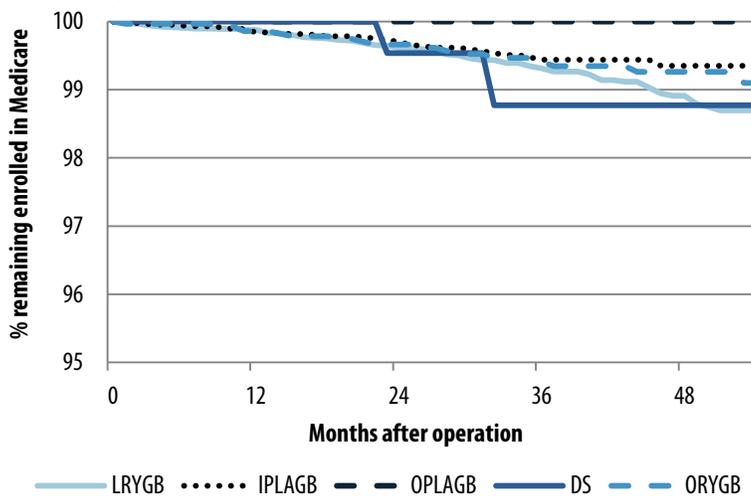
LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

Figure 9: Kaplan-Meier curve describing the disenrollment of disabled Medicare beneficiaries following bariatric surgery, overall and by type of operation, 2006-2009*

9a: Overall



9b: By type of operation



Note: Figures shown on 95% to 100% scale.

* Events censored at the end of the observation period (December 31, 2010), when the patient reached age 65, and at death. LRYGB: laparoscopic Roux-en-Y gastric bypass; IPLAGB: inpatient laparoscopic adjustable gastric banding; OPLAGB: outpatient laparoscopic adjustable gastric banding; DS: laparoscopic biliopancreatic diversion with duodenal switch; ORYGB: open Roux-en-Y gastric bypass.

This finding may be due, in part, to some obese beneficiaries having other disabilities (e.g., mental health problems).⁸ Investigation into the effect of bariatric surgery on ability to obtain gainful employment is warranted.

This report is limited to services covered by Medicare from 2006 through 2009. Thus, the following procedures were not included: open adjustable gastric banding, open and laparoscopic sleeve gastrectomy, open and laparoscopic vertical banded gastroplasty, and gastric balloon. Also, bariatric operations performed at facilities other than Level 1 Bariatric Surgery Centers or Bariatric Surgery Centers of Excellence are not included.¹⁰ Finally, while all patients in our cohort were morbidly obese, further BMI analysis within our population was not possible as BMI is not included in CMS data. We cannot estimate population rates of bariatric surgery as we do not have information on the prevalence of morbid obesity in the Medicare elderly or disabled populations. Thus, it is not possible to comment on the percentage of obese persons undergoing bariatric surgery or assess whether surgery is more commonly used in some population subgroups than others.

CONCLUSION

Use of bariatric surgery in Medicare patients has dramatically increased since its expansion of coverage in 2006. We observed increases in operations in both the age-eligible and working-age disabled groups. Most operations were performed on disabled beneficiaries, but the proportion of age-eligible operations increased over time. While mortality was relatively low and rehospitalization rates moderate, it did not appear that bariatric surgery was associated with health status improvements great enough to warrant return to the workforce.

AUTHORS

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Appendix A: Number of Medicare beneficiaries who received bariatric surgery for morbid obesity, by patient demographics and type of surgery, 2006-2009

	Total	LRYGB	IPLAGB	OPLAGB	DS	ORYGB
Age (years)						
Disabled Beneficiaries						
18 - 34	2,494	1,574	567	25	47	281
35 - 44	5,885	3,528	1,525	66	75	691
45 - 54	9,122	5,320	2,587	99	116	1,000
55 - 64	9,742	5,090	3,508	132	103	909
Elderly Beneficiaries						
65 - 66	4,551	1,979	2,136	106	29	301
67 - 70	4,566	1,707	2,471	121	24	243
71+	1,439	386	952	*	*	57
Sex						
Male	9,648	4,716	3,720	141	142	929
Female	28,151	14,868	10,026	447	257	2,553
Race						
White	30,931	15,795	11,465	495	341	2,835
Black	5,368	2,929	1,812	85	36	506
Other	1,487	854	462	*	*	141
Region						
Midwest	10,281	5,791	3,104	110	219	1,059
Northeast	6,902	3,141	2,557	244	38	923
Southeast	10,228	5,450	3,795	94	46	843
Southwest	4,891	2,211	2,223	77	16	365
West	5,492	2,990	2,067	63	80	292

*Omitted due to small cell size.

Totals are derived from rates and may not sum exactly due to rounding.

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