



The Fifth Annual HealthGrades Bariatric Surgery Trends in American Hospitals Study

May 2010

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HEALTHGRADES®

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Obesity is recognized as a major public health problem in America that initiates and contributes to a wide variety of serious health problems. Bariatrics is the branch of medicine that deals with the causes, prevention and treatment of obesity. Bariatric surgery directed at reducing caloric intake and controlling obesity has been on the rise for over twenty years. In this report, HealthGrades examines recent trends in obesity and bariatric surgery in the U.S. This analysis identifies patient outcomes for inpatient bariatric surgery using three years of data (2006-2008) from 19 all-payer states where data are publicly available. This analysis also identifies top-performing hospitals in bariatric surgery to establish a best-practice benchmark against which other hospitals can be evaluated. Hospitals are assigned a 5-star (best), 3-star (as expected) or 1-star (poor) based on their rates of risk-adjusted in-hospital complications. Individual hospital quality results from this study are available at www.HealthGrades.com.

Executive Summary

Obesity is recognized as a major public health problem in America. The number of overweight, obese, and morbidly obese Americans has steadily increased and now represents the most challenging public health issue in the U.S. Obesity initiates and contributes to a wide variety of serious health problems. Controlling and treating obesity through non-surgical interventions has proven largely unsuccessful for the majority of patients, leading to increased interest in surgical procedures aimed at curbing hunger and reducing caloric intake.

In recent years, several surgical procedures have been developed to address obesity. As a group, these surgical procedures are collectively referred to as “bariatric surgery.” In contrast to non-surgical treatments, bariatric surgery has been demonstrated to be highly effective in reducing a patient’s weight with subsequent reduction or elimination of many of the health problems associated with obesity. This success has encouraged an explosion in the number of bariatric surgeries being performed annually in the U.S.

Among the key findings, *The Fifth Annual HealthGrades Bariatric Surgery Trends in American Hospitals Study* found that:

- Nationwide, more bariatric surgeries are being performed both in hospitals and in outpatient settings (*Table 2*).
- Of the 19 states studied, 63.33% of all procedures were performed in five states: California, New York, Texas, Pennsylvania and Florida (*Table 3*).
- Overall, bariatric surgery patients were charged, on average, \$38,254 for a laparoscopic procedure, while the average charge for an open procedure (e.g., gastric bypass or malabsorptive) was \$38,323 (*Table 4*).

- Of all patients, 6.57% paid for their surgery out-of-pocket (self-pay) and did not utilize any type of insurance. There was a 5.42% decrease in the number of self-pay patients from 2006 through 2008 (*Table 5*).
- Five-star rated hospitals, as a group, had fewer complications and had shorter hospital stays compared to 3-star and 1-star hospitals (*Table 12*).
- Patients having bariatric surgery at 5-star hospitals are 42.66% less likely to experience in-hospital complications than patients at 3-star programs, and 66.55% less likely compared to 1-star programs (*Table 13*).
- While in-hospital mortality is generally an uncommon complication, patients had a four times higher risk of dying if they had a bariatric surgery performed at a 1-star hospital compared to a 5-star hospital (*Table 11*).
- Overall, bariatric surgery patients can expect to stay in the hospital, on average, 2.22 days, but average lengths of stay varied by state (*Table 4*).
- If all bariatric programs from 2006 through 2008 had performed at the level of 5-star hospitals, 5,046 patients could have potentially avoided a major in-hospital complication across the 19 states studied (*Table 13*).
- Patients having surgery at 5-star hospitals spent, on average, less time in the hospital (2.00 days) compared to patients treated in 3-star hospitals (2.21 days), and almost a half a day less than patients having surgery in 1-star hospitals (2.48 days) (*Table 12*).
- In this HealthGrades study, Bariatric Centers of Excellence (COE) programs were more likely to receive a 5-star rating than non-COE programs (25.6% of COE programs were 5-star rated while only 10.9% of non-COE programs received a 5-star rating).

Morbid Obesity and Bariatric Surgery Trends in America

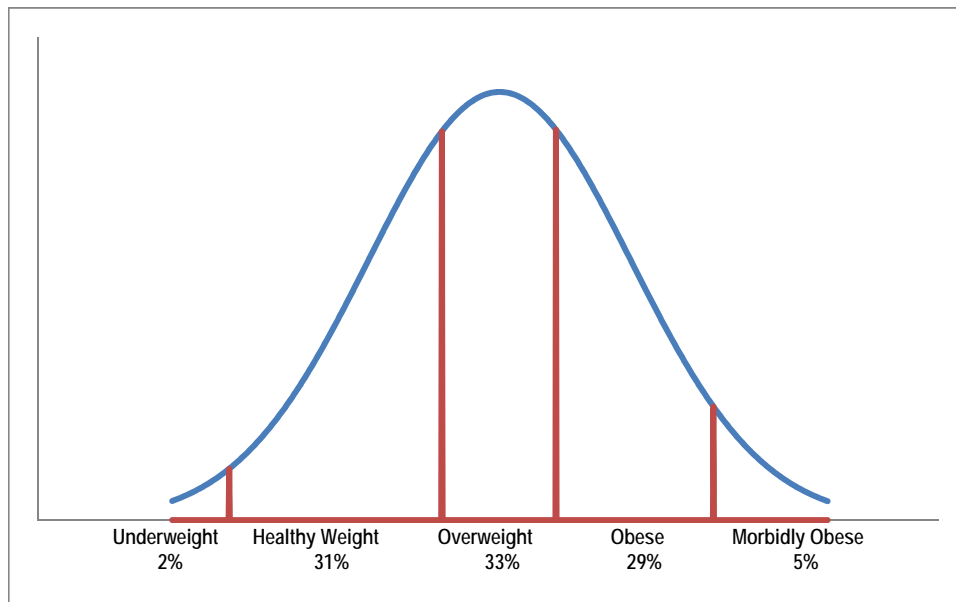
Bariatric surgery is recognized as an effective treatment for obesity, especially in those patients noted to have extreme obesity, also referred to as "morbid obesity" (*Table 1, Figure 1*). Morbid obesity carries an extensive risk of life-threatening complications such as heart disease, diabetes and high blood pressure. Morbid obesity affects approximately 4.7% of the U.S. population.¹

Table 1. Defining Overweight and Obesity

Clinical Description	Body Mass Index	Example: Adult 5 ft 9 in Tall Weight Range	Approximate Percent of U.S. Population
Underweight	< 18.5	124 lbs or less	2%
Healthy Weight	18.5 to 24.9	125 to 168 lbs	31%
Overweight	25 to 29.9	169 to 202 lbs	33%
Obese	30 to 39.9	203 to 270 lbs	29%
Morbidly Obese	40 or more	271 lbs or more	5%

*Centers for Disease Control and Prevention, November 2007 study. www.cdc.gov/obesity/defining.html

Figure 1. Distribution of Body Mass Index and U.S. Population



According to the Centers for Disease Control and Prevention, November 2007 study:

More than one-third of U.S. adults (over 72 million people) were obese in 2005 – 2006.

- More than one-third of U.S. adults—over 72 million people—were obese in 2005-2006. This includes 33.3% of men and 35.3% of women.¹
- Adults age 40-59 had the highest obesity prevalence compared with other age groups. Approximately 40% of men in this age group were obese, compared with 28% of men age 20-39, and 32% of men age 60 and older.¹
- Among women, 41% of those age 40-59 were obese compared with 30.5% of women age 20-39. Women age 65 and older had obesity prevalence rates comparable with women in the 20-39 age group.¹
- Large, race-ethnic disparities in obesity are prevalent among women. Approximately 53% of non-Hispanic black women and 51% of Mexican-American women age 40-59 were obese compared with about 39% of non-Hispanic white women of the same age. Among women 60 and older, 61% of non-Hispanic black women were obese compared with 37% of Mexican-American women and 32% of non-Hispanic white women.¹
- Strikingly, in 2008, all but one state in the contiguous United States had an obesity prevalence of more than 20%, with most states showing a 25% to 29% rate of obesity (Figure 2).

Figure 2. Percent of U.S. Adults that are Obese (BMI ≥ 30)

2008

CDC
SAFER • HEALTHIER • PEOPLE

Legend:

- No Data
- <10%
- 10%–14%
- 15%–19%
- 20%–24%
- 25%–29%
- ≥30%

Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2008. www.cdc.gov/obesity/data/trends.html.

Health issues associated with obesity include life-threatening conditions like diabetes, heart disease, and high blood pressure, and functional problems like sleep apnea, respiratory problems, and severe orthopedic and joint problems. Obesity and being overweight also substantially increases the risk of endometrial, breast, prostate, and colon cancers. In general, the amount of excess weight carried by a patient correlates with the number and severity of the associated health problems. The patients with the most severe health problems tend to be those with morbid obesity. Bariatric surgery is recognized as an effective treatment for obesity and morbid obesity and is frequently recommended for this subset of patients.

The striking weight loss noted after bariatric surgery (frequently equivalent to one-third of a patient's body weight or more) has been shown to rapidly improve the patient's overall health status. Many patients are noted to have either significant improvement or to be completely cured of a variety of major health problems including diabetes, high blood pressure and sleep apnea.² Because of these favorable outcomes, the number of bariatric surgeries has continued to steadily increase in recent years. In 2008, an estimated 220,000 bariatric surgeries were performed in the U.S. (*Table 2*).³ The estimated number of bariatric surgeries performed in the U.S. in 2008 was more than 13 times the number performed in 1992 (*Table 2*).³

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Table 2. Total Number of Procedures Performed by Year

Year	Number of Procedures Performed*
1992	16,200
1998	13,386
2002	63,100
2004	140,640
2008	220,000

American Society for Metabolic & Bariatric Surgery, www.asbs.org.

* Number of procedures performed includes inpatient and outpatient surgeries from all 50 states.

Associated Risks and Assuring Best Patient Outcomes

Like most major and invasive surgeries, bariatric surgery has many benefits that must be weighed against the associated risks. These risks include death, a variety of minor to extremely serious complications, and long-term risks such as nutritional absorption deficiencies (the inability to adequately absorb enough nutrients from the food consumed). In addition, patients who are appropriate candidates for bariatric surgery frequently have other conditions such as heart disease, high blood pressure, diabetes, and lung problems that increase their surgical risks. To assure the best outcomes for patients undergoing bariatric surgery, it is imperative that bariatric surgery programs:

- Ensure appropriate patient selection
- Identify individual patient risks
- Provide appropriate interventions to reduce these risks
- Have surgeons with adequate experience and/or appropriate supervision

Evaluating Bariatric Surgery Programs

Since 1998, HealthGrades has studied and measured outcomes associated with a wide array of common inpatient procedures and diagnoses at the nation's approximately 5,000 hospitals, and has published results on the web to assist consumers in choosing a hospital and physician that are right for them. In this fifth annual study, HealthGrades studied and measured the risk-adjusted in-hospital complication rates associated with bariatric surgery programs that are affiliated with hospitals in all of the 19 states where data are publicly available. We analyzed 190,502 all-payer bariatric surgery discharges from 2006 through 2008 and calculated risk-adjusted complication rates to assign hospitals a 5-star (best), 3-star (as expected), or 1-star (poor) quality rating for bariatric surgery. Individual hospital quality results from this study are available at www.HealthGrades.com.

Additionally for this study, we analyzed overall trends associated with bariatric surgery from 2006 through 2008 among 684 hospitals located in 19 states and we also analyzed the differences in in-hospital complications between the 5-star, 3-star and 1-star hospitals. The 19 states included in this study are:

- Arizona
- California
- Colorado
- Florida
- Iowa
- Maine
- Maryland
- Massachusetts
- New Jersey
- New York
- North Carolina
- Oregon
- Pennsylvania
- Rhode Island
- Texas
- Utah
- Virginia
- Washington
- Wisconsin

Out of 684 hospitals, 481 met the volume criteria to be rated. Out of these 481 hospitals, 92 received a 5-star rating.

Hospital Bariatric Surgery Ratings Results

In the first part of this study, hospital bariatric surgery programs were evaluated on their risk-adjusted in-hospital complications and assigned a 5-star (best performance), 3-star (as expected performance) or 1-star (poor performance) rating.

Out of the 684 hospitals initially evaluated in this study, 481 hospitals met the volume criteria of 30 cases over the three years and five cases in 2008 to receive a star rating.

HealthGrades' ratings of 481 hospitals, based on *The Fifth Annual HealthGrades Bariatric Surgery Trends in American Hospitals Study*, can be found at www.HealthGrades.com. For bariatric surgery:

- 92 hospitals (19.13%) stand out as "best" performers (5-star rated)
- 284 hospitals (59.04%) were rated as "as expected" performers (3-star rated)
- 105 hospitals (21.83%) were rated as "poor" performers (1-star rated)

Study Results and Trends

The purpose of the second part of the study was to evaluate trends and outcomes in bariatric surgery procedures performed in the inpatient setting in hospitals located within 19 states. Procedure type and volume, payer type, and observed mortality and complication rates were also evaluated for trends. Overall performance comparisons between 5-star, 3-star and 1-star rated hospitals were evaluated using observed-to-expected ratios (O/E ratios).

- An O/E ratio of less than one means that the patient population measured had fewer complications than expected.
- An O/E of greater than one means that the patient population measured had more complications than expected.

The Number of Inpatient Procedures is Increasing

Nationwide, more bariatric surgeries are being performed overall (*Table 2*). In the 19 states studied, there was a total of 190,502 bariatric inpatient surgery procedures performed in 684 hospitals from 2006 through 2008. During this time, the number of inpatient procedures increased by 16.03% with 59,356 procedures performed in 2006 and 68,868 procedures in 2008 (*Table 3*).

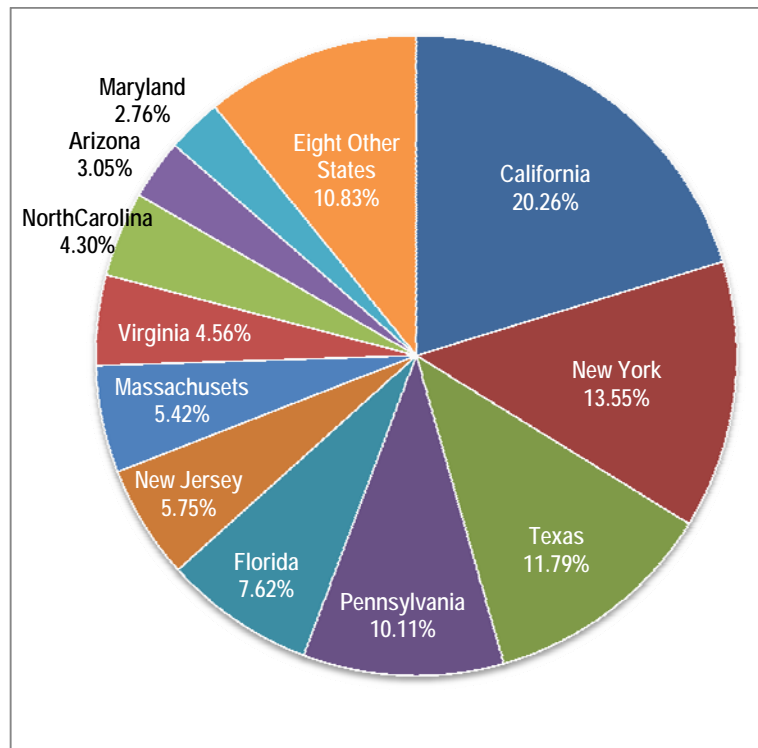
All but one state showed increases in the number of procedures performed with increases ranging from 2.13% to 82.45%. Colorado was the only state that saw a decrease (1.23%) in the number of procedures from 2006 through 2008 (*Table 3*).

Majority of Procedures Performed in Five States

In evaluating procedures by state:

- Of the 19 states studied, 63.33% of all procedures were performed in five states: California (20.26%), New York (13.55%), Texas (11.79%), Pennsylvania (10.11%) and Florida (7.62%) (*Table 3, Figure 3*).
- Washington had the single largest percentage increase in procedures over the study period with an 82.45% increase in procedures performed, followed by Rhode Island with a 74.52% increase (*Table 3*).
- Texas had the largest increase in the number of procedures over the study period with 1,839 additional procedures in 2008 compared to 2006 (*Table 3*).

Figure 3. Percent of Total Cases by State



Of the 19 states studied, 63.33% of all procedures were performed in five states: California, New York, Texas, Pennsylvania and Florida.

Table 3. Bariatric Surgery Hospital Volume Trends by State and Year

State	2006	2007	2008	2006-2008	Percent of Total Cases (2006-2008)	Percent Change 2006 to 2008
Arizona	1,636	1,813	2,363	5,812	3.05%	44.44%
California	12,762	12,137	13,693	38,592	20.26%	7.30%
Colorado	1,217	1,166	1,202	3,585	1.88%	-1.23%
Florida	4,371	4,882	5,257	14,510	7.62%	20.27%
Iowa	759	817	918	2,494	1.31%	20.95%
Maine	505	591	574	1,670	0.88%	13.66%
Maryland	1,808	1,590	1,857	5,255	2.76%	2.71%
Massachusetts	3,331	3,263	3,730	10,324	5.42%	11.98%
New Jersey	3,417	3,859	3,687	10,963	5.75%	7.90%
New York	8,219	8,459	9,135	25,813	13.55%	11.14%
North Carolina	2,481	2,752	2,966	8,199	4.30%	19.55%
Oregon	892	1,116	1,072	3,080	1.62%	20.18%
Pennsylvania	5,753	6,474	7,040	19,267	10.11%	22.37%
Rhode Island	314	445	548	1,307	0.69%	74.52%
Texas	6,542	7,542	8,381	22,465	11.79%	28.11%
Utah	597	589	709	1,895	0.99%	18.76%
Virginia	2,768	2,779	3,133	8,680	4.56%	13.19%
Washington	718	851	1,310	2,879	1.51%	82.45%
Wisconsin	1,266	1,153	1,293	3,712	1.95%	2.13%
All	59,356	62,278	68,868	190,502	100.00%	16.03%

Length of Stay and Cost by State

- Overall, bariatric surgery patients can expect to stay in the hospital, on average, 2.22 days but average lengths of stay varied by state (*Table 4 and 12*).
- Patients in Rhode Island, on average, spent the most time in the hospital (2.77 days), while patients in Utah, on average, spent the least amount of time in the hospital (1.78 days) (*Table 4*).
- Overall, bariatric surgery patients were charged, on average, \$38,254 for a laparoscopic procedure, while the average charge for an open procedure (e.g., gastric bypass or malabsorptive) is \$38,323 (*Table 4*).
- New Jersey was, on average, the most expensive state for open bariatric surgery procedures with an average charge of \$70,237 per procedure. California was, on average, the most expensive state for laparoscopic (\$53,357) and second most expensive for open bariatric surgery procedures (\$65,217) (*Table 4*).
- Maryland was the least expensive state for both laparoscopic and open bariatric surgery procedures with an average charge per procedure of \$14,880 and \$16,285 respectively. Maryland also had the second shortest length of stay (1.93 days), with Utah having the shortest length of stay (1.78 days) (*Table 4*).

Table 4. Average Length of Stay and Charge by State

State	Length of Stay	Average Cost Laparoscopic Procedures	Average Cost Open Procedures
Arizona	2.04	\$36,037	\$43,479
California	2.21	\$53,357	\$65,217
Colorado	2.70	\$39,416	\$51,304
Florida	2.10	\$42,859	\$43,689
Iowa	2.51	\$31,462	\$32,995
Maine	2.30	Not Available	Not Available
Maryland	1.93	\$14,880	\$16,285
Massachusetts	2.32	\$26,301	\$24,641
New Jersey	2.11	\$39,404	\$70,237
New York	2.25	\$23,603	\$21,218
North Carolina	2.34	\$33,429	\$35,983
Oregon	2.12	\$25,223	\$30,908
Pennsylvania	2.42	\$42,635	\$44,093
Rhode Island	2.77	\$23,201	\$38,276
Texas	2.00	\$43,439	\$37,180
Utah	1.78	\$22,544	\$33,179
Virginia	2.07	\$33,841	\$28,639
Washington	2.47	\$35,137	\$34,548
Wisconsin	2.63	\$28,353	\$33,279
Average All Patients	2.22	\$38,254	\$38,323

Patients with Commercial Insurance Represent Majority of Patients

In evaluating payer mix, patients with commercial insurance represent the majority of patients undergoing bariatric procedures in the U.S. today (including Blue Cross, Blue Cross HMO, Commercial Self-insured, and HMO/PPO). VA/Government plans had the largest percentage decrease in procedures from 2006 through 2008.

- Commercial insurance accounted for 74.89% of the patients undergoing the procedure, followed by Government insurance (VA/Government, Medicare, Medicaid and TRICARE) at 18.24%, and self-pay at 6.57% (*Table 5*).
- The largest increases in rate of procedures were among those patients in Medicare (75.90%) and Blue Cross plans (32.45%) followed by commercial/self-insured patients (28.20%) (*Table 5*).
- The number of self-pay patients decreased by 5.42% from 2006 through 2008. Of all patients, 6.57% paid for their surgery out-of-pocket and did not utilize any type of insurance (*Table 5*).
- The highest rates of self-pay patients were in Florida (23.29%), Arizona (16.50%), Texas (12.12%) and Washington (9.76%) (*Appendix B*).
- Medicare and Medicaid combined paid for 15.05% of bariatric surgeries nationwide.

Table 5. Bariatric Surgery Volume Trends by Payer and Year

Payer	2006	2007	2008	2006-2008	Percent of Total Cases 2006-2008	Percent Change from 2006 to 2008
Commercial Insurance						
Blue Cross	9,903	11,992	13,117	35,012	18.38%	32.45%
Blue Cross HMO	3,728	3,335	3,826	10,889	5.72%	2.63%
Commercial, Self-insured	6,511	6,716	8,347	21,574	11.32%	28.20%
HMO/PPO	24,761	23,880	26,554	75,195	39.47%	7.24%
Government Programs						
TRICARE	1,164	990	1,214	3,368	1.77%	4.30%
Medicaid	3,839	3,908	4,066	11,813	6.20%	5.91%
Medicare	4,150	5,414	7,300	16,864	8.85%	75.90%
VA/Government	855	1,292	557	2,704	1.42%	-34.85%
Other						
Self-pay	4,038	4,655	3,819	12,512	6.57%	-5.42%
Unknown/Other	353	19	7	379	0.20%	-98.02%
Worker's Compensation	54	77	61	192	0.10%	12.96%
All	59,356	62,278	68,868	190,502	100.00%	16.03%

The highest rates of self-pay patients were in Florida, Arizona, Texas and Washington.

A Trend Toward Less-invasive Laparoscopic Procedures Continues

In the 19 states evaluated from 2006 through 2008, there was a shift in the number of inpatient procedures from traditional invasive procedures to less-invasive laparoscopic procedures.

- In the 19 states evaluated, 190,502 inpatient procedures were performed. Of these, 21,057 procedures were gastric bypass procedures, 4,665 were malabsorptive procedures, and 164,780 were laparoscopic procedures (*Table 6*). See *Appendix C* for detailed descriptions of each of these types of procedures.
- In 2006, laparoscopic procedures represented 83.18% of all procedures, and by 2008 they represented 88.93% of all bariatric procedures (*Table 6*).
- From 2006 through 2008, open gastric bypass procedures declined by 42.82% while during the same time period, laparoscopic procedures increased 24.04% (*Table 6*).
- The lower complication rate may be one reason for the popularity of laparoscopic procedures. On average, laparoscopic procedures had a complication rate of 5.49%, while gastric bypass procedures had a complication rate of 11.64%, and malabsorptive procedures had a complication rate of 7.01% (*Table 7*).

From 2006 through 2008, laparoscopic procedures increased by 24.04%.

Table 6. Frequency of Bariatric Surgery Codes by Year

ICD-9 Principle Procedure Code	Procedure Type	2006	2007	2008	Total	Percent Change (2006 through 2008)
Gastric Bypass						
44.31	High Gastric Bypass	1,992	951	385	3,328	-80.67%
44.39	Other Gastroenterostomy	7,176	5,696	4,857	17,729	-32.32%
Totals (& Average Percent Change)		9,168	6,647	5,242	21,057	-42.82%
Laparoscopic						
44.38	Laparoscopic Gastroenterostomy	38,882	37,941	40,545	117,368	4.28%
44.68	Laparoscopic Gastroplasty	1,556	1,702	1,053	4,311	-32.33%
44.95	Laparoscopic Gastric Restrictive Procedure	8,935	14,521	19,645	43,101	119.87%
Totals (& Average Percent Change)		49,373	54,164	61,243	164,780	24.04%
Malabsorptive						
45.91	Small-to-Small Intestinal Anastomosis	338	342	361	1,041	6.80%
43.89	Other Partial Gastrectomy	477	1,125	2,022	3,624	323.90%
Totals (& Average Percent Change)		815	1,467	2,383	4,665	192.39%
Totals All Procedures		59,356	62,278	68,868	190,502	16.03%

Risk-adjusted Inhospital Complication Rates Decreased

From 2006 through 2008, risk-adjusted inhospital complication rates decreased for all procedures.

- Overall, the risk-adjusted complication rate decreased 10.64% for all procedures.
- Gastric bypass procedures had the largest decrease in risk-adjusted complication rates (-14.08%) followed by laparoscopic procedures with a decrease of 10.70%. However, malabsorptive procedures saw a 1.87% increase in risk-adjusted complication rates (*Table 7*).
- Laparoscopic bariatric procedures had the lowest overall rates of complications (5.49%), while gastric bypass and malabsorptive procedures had higher overall rates of complications (11.64% and 7.01% respectively) (*Table 7*).

Laparoscopic bariatric procedures had the lowest overall rates of complications (5.49%), while gastric bypass and malabsorptive procedures had higher overall rates of complications (11.64% and 7.01% respectively).

Table 7. Risk-adjusted Complications for Inpatient Bariatric Procedures

Principle Procedure Type	Year	Case Volume	Observed Rate of Inhospital Complications	Expected Rate of Inhospital Complications	Observed -to- Expected Ratio	95% Confidence Interval Observed-to- Expected Ratio	Observed-to-Expected Percent Change 2006 to 2008
Gastric Bypass							
	2006	9,168	11.91%	11.31%	1.05	(1.00-1.11)	
	2007	6,647	11.78%	11.88%	.99	(.93-1.05)	
	2008	5,242	10.97%	12.12%	.91	(.83-.98)	
	2006-2008	21,057	11.64%	11.69%	1.00	(.96-1.03)	-14.08%
Laparoscopic							
	2006	49,373	6.04%	5.64%	1.07	(1.04-1.11)	
	2007	54,164	5.39%	5.46%	.99	(.95-1.02)	
	2008	61,243	5.13%	5.36%	.96	(.92-.99)	
	2006-2008	164,780	5.49%	5.48%	1.00	(.98-1.02)	-10.70%
Malabsorptive							
	2006	815	9.08%	8.41%	1.08	(.86-1.30)	
	2007	1,467	7.36%	6.51%	1.13	(.94-1.32)	
	2008	2,383	6.08%	5.53%	1.10	(.94-1.26)	
	2006-2008	4,665	7.01%	6.34%	1.11	(1.00-1.21)	1.87%
All Bariatric Surgery Procedures							
	2006	59,356	6.99%	6.55%	1.07	(1.04-1.10)	
	2007	62,278	6.12%	6.17%	.99	(.96-1.02)	
	2008	68,868	5.60%	5.88%	.95	(.92-.98)	
	2006-2008	190,502	6.20%	6.19%	1.00	(.99-1.02)	-10.64%

Improvements Seen in Decreasing Mortality Rates

Over the three years studied (2006 through 2008), 130 patients receiving bariatric surgery died during their hospital stay. This represents 0.068% or less than one patient in 1,000. Fortunately, these outcomes are improving with the rate for 2008 (0.062%) being over 25% lower than the rate for 2006 (0.086%).

Table 8. Mortality Rate by Year

Year	Case Volume	Inhospital Mortality	Mortality Rate by Year
2006	59,356	51	0.086%
2007	62,278	36	0.058%
2008	68,868	43	0.062%
Total	190,502	130	0.068%

Hemorrhage was Most Frequently Occurring Complication

The most frequently occurring complications among patients undergoing bariatric surgery were hemorrhages (excessive or uncontrolled bleeding), followed by gastrointestinal complications, operative lacerations (arteries, nerves, and/or other structures inadvertently cut or damaged during surgery), and respiratory complications (lungs failing to function adequately during and after surgery) (*Table 9*).

Table 9. Top Five Inhospital Complications Associated with Bariatric Surgery (2006 – 2008)

Complication	Rate
Hemorrhage Complicating a Procedure	0.97%
Surgical Complication of Gastrointestinal System	0.92%
Accidental Operative Laceration	0.80%
Post-operative Pulmonary Insufficiency	0.72%
Surgical Complication of Respiratory System	0.70%

Hospitals with Highest Volume had Lowest Complication Rates

During the study period, volume was an important indicator of inpatient complications. As volume increased, risk-adjusted complications had statistically significant decreases.

- Hospitals with the highest volume (375 cases or more during the three years of study) had the lowest rate of risk-adjusted inpatient complications overall with an observed-to-expected ratio of 0.94 (6% fewer complications than expected) (*Table 10*).
- Hospitals with the lowest volumes (less than 75 cases over three years) had the highest rate of risk-adjusted inpatient complications with an observed-to-expected ratio of 1.30 (30% more complications than expected) (*Table 10*).
- Higher-volume programs, those with greater than 375 cases over three years, have a 38.30% lower risk of patient complications than lower volume programs, those with less than 75 cases over three years (*Table 10*).
- Five-star hospitals had an average case volume of 646 surgeries performed over three years, while 1-star hospitals averaged 384 cases over three years (*Table 11*).

Hospitals with lowest volumes had 30% more complications than expected.

Table 10. Inhospital Complication Rates by Volume of Procedures Performed (2006 – 2008)

Procedure Volume 2006 to 2008	Observed Rate of Inhospital Complications	Expected Rate of Inhospital Complications	Case Volume	Observed-to-Expected Ratio	Confidence Interval
< 75	8.86%	6.82%	6,047	1.30	(1.21-1.39)
75-149	7.41%	6.43%	9,987	1.15	(1.08-1.22)
150-374	6.93%	6.06%	39,133	1.14	(1.11-1.18)
375 +	5.79%	6.17%	135,335	0.94	(.92- .96)

Large Gaps in Quality Between Best and Worst Providers

In the first part of this study, hospital bariatric surgery programs were evaluated on their risk-adjusted inhospital complications and assigned a 5-star (best performance), 3-star (as expected performance) or 1-star (poor performance).

Out of the 684 hospitals initially evaluated in this study, 481 hospitals met the volume criteria of 30 cases over the three years and five cases in 2008 to receive a star rating. Of these 481 hospitals, 92 received a 5-star rating, 284 received a 3-star rating, and 105 received a 1-star rating.

Hospitals were aggregated into their appropriate peer group by star rating and evaluated as a group for differences in performance.

- Overall, inhospital mortality is low with an average of less than 0.07% (less than 1 in 1,000) across all 19 states (*Table 11*).
- While inhospital mortality is generally an uncommon complication, the death rate at 5-star rated hospitals was about one-fourth the rate at 1-star rated hospitals (0.03% versus 0.12%) (*Table 11*).

Table 11. Bariatric Surgery Mortality and Age at U.S. Hospitals (2006 – 2008)

Hospital Bariatric Surgery Star Rating	Number of Hospitals	Average Patient Age (Years)	Average Volume (2006-2008)	Inhospital Unadjusted Mortality Rate	P value (Mortality Compared to U.S.)
1-star	105	44.63	384	0.12%	.002
3-star	284	44.02	304	0.07%	NS
5-star	92	43.34	646	0.03%	< .001
U.S. Total*	684				
U.S. Average*		43.93	279	0.07%	

*U.S. total and average includes all hospitals (rated and not rated).

Patients had a four times higher risk of dying if they had a bariatric surgery performed at a 1-star hospital compared to a 5-star hospital (unadjusted mortality rates of 0.12% compared to 0.03%).

Fewer Complications and Shorter Stays at 5-Star Rated Hospitals

Five-star rated hospitals, as a group, had fewer complications and had shorter hospital stays (length of stay) (*Table 12*).

- Despite the fact that the expected complication rate was approximately the same (between 6.00% and 6.49%), patients having bariatric surgery at 5-star hospitals were 40.77% less likely to experience actual complications than patients having bariatric surgery at 3-star programs and 68.09% less likely to experience complications compared to 1-star programs (*Table 12*).
- After adjusting for patient risk factors, a typical patient having a bariatric surgical procedure at a 5-star rated hospital in one of the 19 states studied had, on average, a 66.55% lower chance of experiencing one or more inhospital complications than at a 1-star rated hospital, and a 42.66% lower chance than at a 3-star rated hospital (*Table 12*).
- Patients having a procedure at a 5-star hospital spent, on average, almost a half a day less (2.00 days) compared to patients treated at 1-star hospitals (2.48 days) (*Table 12*).

Patients having a bariatric surgical procedure at a 5-star hospital have, on average, a 66.55% lower chance of experiencing one or more inhospital complications compared to a 1-star hospital.

Table 12. Bariatric Surgery Complications and Lengths of Stay (2006 – 2008)

Hospital Bariatric Surgery Star Rating	Observed Inhospital Complication Rate	Expected Inhospital Complication Rate	Observed-to-Expected Complication Ratio	P value (O:E Compared to U.S.)	Average Length of Stay (Days)
1-star	10.83%	6.49%	1.67	< .001	2.48
3-star	5.83%	6.00%	0.97		2.21
5-star	3.46%	6.20%	0.56	< .001	2.00
U.S. Average*	6.20%	6.19%	1.00		2.22
Relative difference between 5-star compared to 1-star	68.09%	4.58%	66.55%		19.48%
Relative difference between 5-star compared to 3-star	40.77%	-3.30%	42.66%		9.55%

Five-star Hospitals had Lower Complication Rates Across Every Procedure Type

Five-star hospitals also had lower overall inhospital complication rates than their 3-star and 1-star counterparts across every procedure type, both laparoscopic and open procedures (*Table 13*). The largest variation in complication rates among 5-star and 1-star hospitals were associated with the:

- Small-to-small intestinal anastomosis (5.22% complications versus 25.97%), and
- Other gastroenterostomy (6.09% complications versus 20.96%) (*Table 13*).

To quantify the impact of this variation in quality, if all bariatric programs from 2006 through 2008 had performed at the level of 5-star hospitals, 5,046 patients could have potentially avoided a major inhospital complication across the 19 states studied (*Table 13*).

In addition, consistent with increased rates of complications, a patient having a procedure at a 1-star hospital could, on average, expect to extend their length of stay by one-half day compared to having their procedure at a 5-star hospital (2.48 days compared to 2.00 days) (*Table 12*).

If all bariatric programs performed at the level of 5-star hospitals, 5,046 patients could have potentially avoided a major inhospital complication across the 19 states studied (2006 – 2008).

Table 13. Bariatric Surgery Hospital Outcomes by Procedure Type (2006 – 2008)

ICD-9 Principle Procedure Code	Procedure Type	Star Rating	Case Volume	Observed Inhospital Complication Rate	Expected Inhospital Complication Rate	Observed- to- Expected Ratio	95% Confidence Interval (O/E Ratio)	Relative Difference of 5-star Compared to 1-star	Relative Difference of 5-star Compared to 3-star	Number of Patients with Potentially Avoidable Inhospital Complications (as Compared to 5-star)
Gastric Bypass										
44.31	High Gastric Bypass	1	637	20.09%	11.05%	1.82	(1.60-2.03)	60.88%	15.15%	89
		3	974	8.11%	9.68%	0.84	(.65-1.03)			
		5	1,543	6.09%	8.57%	0.71	(.55-.87)			
		U.S.*	3,328	9.38%	9.37%	1.00	(.90-1.10)			
44.39	Other Gastroenterostomy	1	3,359	20.96%	13.12%	1.60	(1.51-1.68)	68.38%	50.87%	978
		3	8,021	12.19%	11.86%	1.03	(.97-1.09)			
		5	5,373	6.09%	12.05%	0.51	(.44-.57)			
		U.S.*	17,729	12.06%	12.12%	0.99	(.96-1.03)			
Laparoscopic										
44.38	Laparoscopic Gastroenterostomy	1	25,161	11.87%	7.05%	1.68	(1.64-1.73)	66.89%	42.18%	3,386
		3	52,692	6.25%	6.48%	0.96	(.93-1.00)			
		5	37,171	3.70%	6.63%	0.56	(.52-.60)			
		U.S.*	117,368	6.68%	6.65%	1.00	(.98-1.03)			
44.68	Laparoscopic Gastroplasty	1	772	6.74%	4.33%	1.56	(1.23-1.88)	70.37%	52.91%	64
		3	1,629	3.19%	3.26%	0.98	(.72-1.24)			
		5	1,779	1.69%	3.66%	0.46	(.22-.70)			
		U.S.*	4,311	3.22%	3.60%	0.89	(.74-1.05)			
44.95	Laparoscopic Gastric Restrictive Procedure	1	9,328	4.04%	2.55%	1.58	(1.46-1.71)	61.31%	33.67%	388
		3	20,649	2.27%	2.45%	0.92	(.84-1.01)			
		5	12,321	1.49%	2.44%	0.61	(.50-.72)			
		U.S.*	43,101	2.47%	2.47%	1.00	(.94-1.06)			

Table 13. Bariatric Surgery Hospital Outcomes by Procedure Type (continued)

ICD-9 Procedure Code	Procedure Type	Star Rating	Case Volume	Observed Inhospital Complication Rate	Expected Inhospital Complication Rate	Observed-to-Expected Ratio	95% Confidence Interval (O/E Ratio)	Relative Difference of 5-star Compared to 1-star	Relative Difference of 5-star Compared to 3-star	Number of Patients with Potentially Avoidable Inhospital Complications (as Compared to 5-star)
Malabsorptive										
45.91	Small-to-Small Intestinal Anastomosis	1	181	25.97%	11.32%	2.29	(1.90-2.69)	77.45%	47.45%	62
		3	492	11.18%	11.35%	0.98	(.74-1.23)			
		5	364	5.22%	10.09%	0.52	(.21-.82)			
		U.S.*	1,041	11.62%	10.89%	1.07	(.90-1.24)			
43.89	Other Partial Gastrectomy	1	850	7.88%	4.77%	1.65	(1.36-1.95)	59.04%	36.82%	79
		3	1,832	5.95%	5.55%	1.07	(.89-1.25)			
		5	864	2.89%	4.27%	0.68	(.36-.99)			
		U.S.*	3,624	5.68%	5.04%	1.13	(.99-1.27)			
All Bariatric Surgery Procedures		1	40,288	10.83%	6.49%	1.67	(1.63-1.70)	66.55%	42.66%	5,046
		3	86,289	5.83%	6.00%	0.97	(.95-1.00)			
		5	59,415	3.46%	6.20%	0.56	(.53-.59)			
		U.S.*	190,502	6.20%	6.19%	1.00	(.99-1.02)			

*U.S. includes aggregate performance of all hospitals (rated or unrated) that performed one or more bariatric surgery cases during the study period within the 19 states studied.

Out of 684 hospitals, 481 met the volume criteria to be rated. Out of these 481 hospitals, 92 received a 5-star rating.

Fourteen States have One or More Hospitals that are 5-star Rated in Bariatric Surgery

In the 19 states studied, 481 hospitals (19.13% of the 2,514 hospitals in the states studied) were eligible to be rated on their bariatric surgery outcomes. Of these eligible hospitals, 92 best performers were recognized with a 5-star rating in bariatric surgery.

Of these best performers, 48 are recipients of the HealthGrades 2010/2011 Bariatric Surgery Excellence Award™; these award recipients represent the top 10% of all eligible hospitals. (See *Appendix A* for a list of award recipients.)

- Fifty-nine or almost two-thirds (64.13%) of the 92 Bariatric Surgery 5-star Hospitals are in four states: California (22), Florida (11), New York (13) and Texas (13) (*Table 14*).
- North Carolina had the highest percentage of their eligible hospitals recognized as a 5-star Hospital in Bariatric Surgery (29.41%), followed by California (28.57%), New York (22.81 %) and Florida (22.45%) (*Table 14*).

Nearly two-thirds (64.13%) of the 92 Bariatric Surgery 5-star Hospitals are in four states: California, Florida, New York and Texas.

Figure 4. Bariatric Surgery 5-star Hospitals by Eligible Hospitals by State

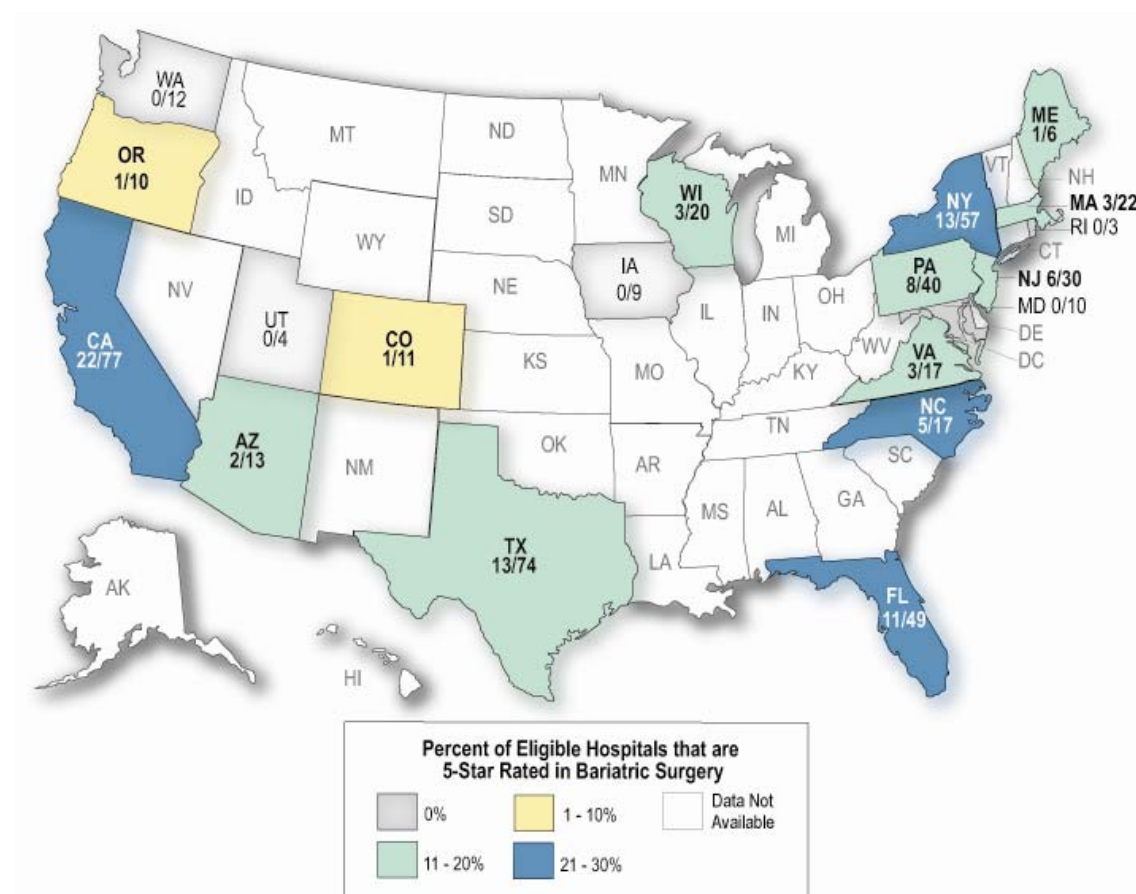


Table 14. Bariatric Surgery 5-star Hospitals Distribution by State

Fifty-nine or almost two-thirds (64.13%) of the 92 Bariatric Surgery 5-star Hospitals are in four states (shaded below): California (22), Florida (11), New York (13), and Texas (13).

State / Abbreviation		Eligible Hospitals	Bariatric Surgery 5-Star Hospitals	% of Eligible Hospitals that are Bariatric Surgery 5-Star Hospitals	% of All Bariatric Surgery 5-Star Hospitals
Arizona	AZ	13	2	15.38%	2.17%
California	CA	77	22	28.57%	23.91%
Colorado	CO	11	1	9.09%	1.09%
Florida	FL	49	11	22.45%	11.96%
Iowa	IA	9	0	0.00%	0.00%
Maine	ME	6	1	16.67%	1.09%
Maryland	MD	10	0	0.00%	0.00%
Massachusetts	MA	22	3	13.64%	3.26%
New Jersey	NJ	30	6	20.00%	6.52%
New York	NY	57	13	22.81%	14.13%
North Carolina	NC	17	5	29.41%	5.43%
Oregon	OR	10	1	10.00%	1.09%
Pennsylvania	PA	40	8	20.00%	8.70%
Rhode Island	RI	3	0	0.00%	0.00%
Texas	TX	74	13	17.57%	14.13%
Utah	UT	4	0	0.00%	0.00%
Virginia	VA	17	3	17.65%	3.26%
Washington	WA	12	0	0.00%	0.00%
Wisconsin	WI	20	3	15.00%	3.26%
Total		481	92	19.13%	100.00%

Center of Excellence Designation Compared to Star Ratings

In 2006, the Centers for Medicare Services expanded its coverage of bariatric procedures and mandated that procedures would be covered only if performed in Center of Excellence (COE) facilities that meet certification requirements from either the American College of Surgeons or the American Society of Bariatric Surgery. Many commercial insurers have since followed Medicare's lead and also require COE certification for network inclusion. Hospitals and surgeons that qualify for COE designation participate in a rigorous evaluation process designed to document that they have a comprehensive program and meet the established program requirements for providing safe bariatric surgical care with excellent short-term and long-term outcomes. The evaluation verifies processes, such as equipment, supplies, training of surgeons and staff, and the availability of consultant services, and records the results.

Some specific requirements for Center of Excellence designation include:

- Minimum number of surgeries performed at the hospital (at least 125 bariatric surgical cases per year)
- Board certification requirements for individual surgeons
- Ongoing education in bariatric surgery
- A full complement of multi-disciplinary staff to meet the pre-operative and post-operative needs of bariatric patients
- Facility accommodations for patients with morbid obesity
- Mandatory outcomes reporting
- Rigorous quality improvement program
- Use of clinical pathways and orders
- Use of nurses dedicated to serving bariatric surgical patients
- Organized and supervised support groups
- Provision for long-term patient follow-up

This study looked at 19 states where data were available. In these 19 states, there were a total of 481 bariatric programs with adequate volume to be included in this study. Of these 481 programs, there were 270 COE-designated programs and 25.6% of these were rated as 5-stars. Of the 211 non-COE programs, only 10.9% were rated as 5-stars. Nationally, there are 470 programs which have received the Bariatric Center of Excellence designation. (Information on Bariatric Centers of Excellence was downloaded from www.surgicalreview.org and CMS in April 2010.)

Interpretation of Results

The increase in prevalence of obesity and extreme obesity has been described as an epidemic, with an estimated 60 million people meeting the criteria for obesity and 9.6 million people meeting the criteria for morbid obesity.⁵ Individuals with obesity and morbid obesity are at greater risk for premature mortality and increased incidence of comorbid conditions such as diabetes, hypertension, arthritis and asthma.⁶ These individuals have also reported a decreased quality of life.⁷ For these individuals, bariatric surgery is largely accepted as the most successful long-term treatment. As such, there has been an increase in the number of procedures performed in the U.S. in recent years. Because individual patient outcomes are highly dependent on the quality of the organization where the procedure is performed, this *Fifth Annual HealthGrades Bariatric Surgery Trends in American Hospitals Study* evaluates the differences in quality between inpatient bariatric surgery programs at hospitals across the country.

The largest increase of procedures was seen among patients in Medicare.

Overall, there has been a substantial increase in the total number of bariatric surgeries being performed annually in the U.S. (*Table 2*). The majority of procedures being performed are among patients with commercial insurance but the largest increase was seen among patients in Medicare (*Table 5*). Perhaps this shift is due in part to the economic impact of obesity and obesity-related health issues. Obesity has been associated with more health care costs than any other condition with one study estimating that obesity contributes to 9.1% of total U.S. medical expenditures.⁷

This HealthGrades study also found a major shift away from traditional open bariatric procedures (which use a single large incision) to less invasive laparoscopic procedures (which use three to six incisions each less than three-quarter inches in length). The increase in laparoscopic procedures was also observed in a 2005 study that showed an exponential increase (44-fold) in the annual rate of minimally invasive laparoscopic bariatric surgery between 1998 and 2002.⁸ Laparoscopic procedures are attractive to potential patients because these procedures:

- Have lower risk during and after surgery
- Have fewer short-term complications
- Require a shorter amount of time spent in the hospital
- Have a faster recovery time

Therefore, the trend towards these procedures is not surprising. However, while our study shows that laparoscopic surgery has lower inpatient (short-term) complication rates, some research suggests that these laparoscopic procedures may have substantial rates of long-term complications which may require revision of the procedure. Additionally, there is evidence to support that these procedures may have inferior weight loss compared to open gastric bypass.² As longer-term outcome data become available, it will be interesting to see if this trend towards laparoscopic procedures continues.

Variation in quality between providers contributes to increased complication rates, longer lengths of stay, and more deaths.

This fifth annual study also found that the risk-adjusted rate of inhospital complications decreased 10.64% from 2006 to 2008 (*Table 7*). This study also suggests large variation in quality among providers. The quality gaps are wide and consistent regardless of the type of procedure performed (*Table 13*). Variation in quality between providers contributes to increased complication rates, longer lengths of stay, and more deaths.

Finally, in this study, volume was an important indicator of quality. As volume increased, risk-adjusted complication rates showed statistically significant decreases (*Table 11*). Both Medicare-recognized accrediting agencies, The American College of Surgeons, and The American Society for Metabolic and Bariatric Surgery require a minimum volume of 125 procedures annually to receive accreditation.⁹ In this study, hospitals that had a three-year volume consistent with this yearly volume requirement had the lowest risk-adjusted complication rates, supporting the link between volume and outcomes.

Five-star hospitals had lower overall in-hospital risk-adjusted complication rates than their 3-star and 1-star counterparts across every procedure type, both laparoscopic and open procedures

Five-star hospitals had nearly twice the volume of the 3-star hospitals and 1-star hospitals (*Table 11*). This may be one key to their consistent high-quality performance. In this study, 5-star hospitals had mortality rates statistically better than the average of all hospitals studied while 1-star hospitals had mortality rates that were statistically worse than the average of all hospitals studied (*Table 11*). Five-star hospitals also had lower overall in-hospital risk-adjusted complication rates than their 3-star and 1-star counterparts across every procedure type, both laparoscopic and open procedures.

The variation in quality that exists between providers reiterates the importance of readily available quality data to help consumers choose an appropriate provider to meet their individual needs. This study found that in the 19 states studied, if all hospitals performed at the level of 5-star hospitals, 5,046 patients could have potentially avoided in-hospital complications. Since this study is limited to 19 states, this emphasizes the need to increase the availability of quality data so that all consumers have the information they need to make a truly informed health care decision.

Fortunately, patients considering bariatric surgery have several advantages:

- Because essentially all bariatric surgeries are performed electively, patients have the time to thoroughly investigate their surgeon and hospital before they make a final decision on where to have a surgery performed.
- Most hospitals are required to report extensive data on a variety of aspects of bariatric surgery (including complications and outcomes) in a standardized format.
- Rapid advances in the science of data analysis and quality measurement have allowed organizations with the appropriate clinical expertise and data processing capabilities to be able to collect, analyze, and present this huge mass of data in a clear, concise format which all patients can understand.

Clearly, bariatric surgery offers potentially life-changing treatments for patients who suffer with obesity, but this marvelous potential must be weighed against the serious risks. Therefore, it is particularly important for patients to have access to reliable, quality information when selecting a bariatric program.

In the 19 states studied, if all hospitals performed at the level of 5-star hospitals, 5,046 patients could have potentially avoided in-hospital complications.

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Health Grades Inc. is the leading independent healthcare ratings organization, providing quality ratings, profiles and cost information on the nation's hospitals, physicians, nursing homes and prescription drugs.

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Appendix A. HealthGrades 2010/2011 Bariatric Surgery Excellence Award™ Recipients

The following hospitals are recipients of HealthGrades 2010/2011 Bariatric Surgery Excellence Award™. * Some of the Bariatric Surgery Excellence Award recipients have multiple locations. In these cases, results for all locations were used in the analysis and each of the facilities is designated as a recipient of the award.

HealthGrades 2010/2011 Bariatric Surgery Excellence Award™ Recipients*	City
Alabama	
<i>Data not available for this state.</i>	
Alaska	
<i>Data not available for this state.</i>	
Arizona	
Mayo Clinic Hospital	Phoenix
Arkansas	
<i>Data not available for this state.</i>	
California	
California Pacific Medical Center - Pacific	San Francisco
<i>including:</i> California Pacific Medical Center - California	San Francisco
Cedars - Sinai Medical Center	Los Angeles
Delano Regional Medical Center	Delano
El Camino Hospital	Mountain View
Fresno Heart and Surgical Hospital	Fresno
Kaiser Foundation Hospital - South San Francisco	South San Francisco
Kaiser Foundation Hospital Richmond	Richmond
Mercy San Juan Medical Center	Carmichael
Mills-Peninsula Health Services	Burlingame
<i>including:</i> Mills Health Center	San Mateo
Scripps Mercy Hospital	San Diego
<i>including:</i> Scripps Mercy Hospital - Chula Vista	Chula Vista
Southwest Healthcare System – Rancho Springs Medical Center	Murrieta
<i>including:</i> Southwest Healthcare System – Inland Valley Medical Center	Wildomar
Colorado	
Rose Medical Center	Denver
Connecticut	
<i>Data not available for this state.</i>	

* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

HealthGrades 2010/2011 Bariatric Surgery Excellence Award™ Recipients*	City
Delaware	
<i>Data not available for this state.</i>	
District of Columbia	
<i>Data not available for this state.</i>	
Florida	
Baptist Hospital Pensacola	Pensacola
Heart of Florida Regional Medical Center	Davenport
Hialeah Hospital	Hialeah
Holy Cross Hospital	Fort Lauderdale
Memorial Hospital	Jacksonville
Ocala Regional Medical Center/West Marion Hospital	Ocala
Palmetto General Hospital	Hialeah
Sacred Heart Hospital	Pensacola
Georgia	
<i>Data not available for this state.</i>	
Hawaii	
<i>Data not available for this state.</i>	
Idaho	
<i>Data not available for this state.</i>	
Illinois	
<i>Data not available for this state.</i>	
Indiana	
<i>Data not available for this state.</i>	
Iowa	
<i>There are no recipients of this award in this state.</i>	
Kansas	
<i>Data not available for this state.</i>	
Kentucky	
<i>Data not available for this state.</i>	
Louisiana	
<i>Data not available for this state.</i>	
Maine	
<i>There are no recipients of this award in this state.</i>	
Maryland	
<i>There are no recipients of this award in this state.</i>	

* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

HealthGrades 2010/2011 Bariatric Surgery Excellence Award™ Recipients*	City
Massachusetts	
Boston Medical Center Corporation	Boston
Newton - Wellesley Hospital	Newton
Michigan	
<i>Data not available for this state.</i>	
Minnesota	
<i>Data not available for this state.</i>	
Mississippi	
<i>Data not available for this state.</i>	
Missouri	
<i>Data not available for this state.</i>	
Montana	
<i>Data not available for this state.</i>	
Nebraska	
<i>Data not available for this state.</i>	
Nevada	
<i>Data not available for this state.</i>	
New Hampshire	
<i>Data not available for this state.</i>	
New Jersey	
Hackensack University Medical Center	Hackensack
Morristown Memorial Hospital	Morristown
New Mexico	
<i>Data not available for this state.</i>	
New York	
Arnot Ogden Medical Center	Elmira
Faxton - Saint Luke's Healthcare	Utica
John T. Mather Memorial Hospital	Port Jefferson
Mercy Medical Center	Rockville Centre
NYU Langone Medical Center	New York
Saint Luke's Roosevelt Hospital	New York
Sisters of Charity Hospital	Buffalo
Westchester Medical Center	Valhalla
North Carolina	
<i>There are no recipients of this award in this state.</i>	

* Distinction cannot be used without a Licensing Agreement from Health Grades, Inc. Continued....

HealthGrades 2010/2011 Bariatric Surgery Excellence Award™ Recipients*	City
North Dakota	
<i>Data not available for this state.</i>	
Ohio	
<i>Data not available for this state.</i>	
Oklahoma	
<i>Data not available for this state.</i>	
Oregon	
<i>There are no recipients of this award in this state.</i>	
Pennsylvania	
Barix Clinics of Pennsylvania	Langhorne
Magee Womens Hospital of the UPMC Health System	Pittsburgh
Sacred Heart Hospital	Allentown
Temple University Hospital	Philadelphia
Western Pennsylvania Hospital	Pittsburgh
Rhode Island	
<i>There are no recipients of this award in this state.</i>	
South Carolina	
<i>Data not available for this state.</i>	
South Dakota	
<i>Data not available for this state.</i>	
Tennessee	
<i>Data not available for this state.</i>	
Texas	
Citizens Medical Center	Victoria
Covenant Medical Center - 19th Street	Lubbock
United Regional Healthcare System	Wichita Falls
University General Hospital	Houston
University Medical Center	Lubbock
Vista Hospital of Dallas	Garland
Utah	
<i>There are no recipients of this award in this state.</i>	
Vermont	
<i>Data not available for this state.</i>	
Virginia	
Bon Secours - Maryview Medical Center	Portsmouth
Inova Fair Oaks Hospital	Fairfax
Sentara Careplex Hospital	Hampton

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HealthGrades 2010/2011 Bariatric Surgery Excellence Award™ Recipients*	City
Washington	
<i>There are no recipients of this award in this state.</i>	
West Virginia	
<i>Data not available for this state.</i>	
Wisconsin	
Columbia Saint Mary's Hospital Milwaukee	Milwaukee
<i>including:</i> Columbia St. Mary's Hospital Columbia	Milwaukee
Wyoming	
<i>Data not available for this state.</i>	

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Appendix B. Percentage of Payers by State (2006 – 2008)

State	Blue Cross	Blue Cross HMO	TRICARE	Commercial, Self-insured	HMO/PPO	Medicaid	Medicare	Self-pay	Unknown/Other	VA/Government	Worker's Compensation
Arizona	0.00%	0.00%	2.31%	8.74%	57.98%	3.34%	10.43%	16.50%	0.60%	0.03%	0.07%
California	0.00%	0.00%	0.00%	5.19%	74.87%	6.06%	6.75%	5.43%	0.22%	1.22%	0.26%
Colorado	13.67%	0.00%	1.37%	5.75%	48.70%	8.51%	13.17%	8.62%	0.00%	0.20%	0.03%
Florida	0.00%	0.00%	5.64%	4.69%	50.85%	2.75%	11.48%	23.29%	0.22%	1.02%	0.06%
Iowa	49.72%	0.00%	1.00%	32.24%	0.00%	7.10%	8.06%	1.16%	0.00%	0.72%	0.00%
Maine	41.26%	0.00%	2.28%	24.25%	0.18%	19.28%	12.16%	0.36%	0.00%	0.24%	0.00%
Maryland	34.29%	10.62%	0.00%	19.11%	20.44%	2.82%	5.10%	5.29%	0.25%	1.92%	0.17%
Massachusetts	6.96%	37.03%	0.00%	2.91%	35.02%	9.31%	6.90%	1.08%	0.05%	0.76%	0.00%
New Jersey	36.97%	3.41%	0.36%	4.28%	41.71%	2.30%	8.27%	2.18%	0.15%	0.36%	0.02%
New York	27.27%	0.00%	0.36%	17.55%	32.20%	12.58%	6.16%	3.18%	0.13%	0.55%	0.02%
North Carolina	48.54%	0.00%	4.35%	8.22%	20.22%	4.15%	6.09%	2.09%	0.40%	5.93%	0.01%
Oregon	33.34%	2.27%	4.84%	21.27%	12.82%	0.58%	16.56%	7.82%	0.39%	0.03%	0.06%
Pennsylvania	28.67%	28.65%	0.00%	9.53%	11.49%	9.65%	9.53%	1.27%	0.05%	1.15%	0.01%
Rhode Island	54.32%	0.00%	1.30%	13.62%	10.86%	12.62%	6.35%	0.92%	0.00%	0.00%	0.00%
Texas	13.16%	0.00%	4.49%	16.77%	37.70%	0.91%	13.70%	12.12%	0.40%	0.52%	0.24%
Utah	25.91%	0.00%	0.00%	30.50%	21.74%	2.59%	5.91%	8.23%	0.05%	5.07%	0.00%
Virginia	40.18%	6.27%	5.55%	13.11%	10.97%	5.07%	6.94%	3.59%	0.00%	8.31%	0.01%
Washington	27.96%	0.00%	3.44%	27.51%	13.96%	1.77%	15.53%	9.76%	0.00%	0.00%	0.07%
Wisconsin	0.00%	0.00%	1.59%	28.10%	42.75%	9.27%	12.53%	3.91%	0.48%	1.37%	0.00%
Totals*	18.38%	5.72%	1.77%	11.32%	39.47%	6.20%	8.85%	6.57%	0.20%	1.42%	0.10%

*Due to rounding, individual values may not sum to the Total.

Appendix C. Types of Bariatric Surgery Procedures

Gastric Bypass

- Smaller stomach is attached to the middle of the small intestine, bypassing the section of the small intestine (duodenum) that absorbs the most calories.
- Stomach is reduced from size of football to size of golf ball.
- Patients eat less because stomach is smaller, and they absorb fewer calories because food does not travel through the duodenum.

Laparoscopic

Adjustable Gastric Banding (also known as Swedish Adjustable Gastric Band or SAGB)

- Silicone band filled with saline is wrapped around the upper part of stomach to create a small pouch and cause restriction. The procedure is like putting a belt around the stomach. The band forms the stomach into two sections, with a small opening between the sections allowing food to pass through.
- Food collects quickly in the small upper section causing most patients to feel full faster and eat less.
- Size of restriction can be adjusted after surgery by adding or removing saline from band.

Malabsorptive Procedures

- Biliopancreatic Diversions (BPD)
- Biliopancreatic Diversion with 'Duodenal Switch'
 - Similar to gastric bypass, but surgeon creates a sleeve-shaped stomach.
 - Smaller stomach is attached to the final section of the small intestine, bypassing the duodenum.
 - Patients eat less because the stomach is smaller and they absorb fewer calories because food does not travel through the duodenum.
- Extended (Distal) Roux-en-Y Gastric Bypass (RYGBP-E)
- Vertical Sleeve Gastrectomy
 - Emerging procedure which is a type of restrictive weight loss surgery.
 - Approximately 85% of the stomach is removed, leaving a sleeve-shaped stomach.
 - No published studies on long-term results.

Combined Malabsorptive/Restrictive Procedures

- Roux-en-Y Gastric Bypass (RYGBP)

Appendix D. HealthGrades Methodology for Rating Hospitals in Bariatric Surgery

To help consumers evaluate and compare hospital performance in bariatric surgery, HealthGrades analyzed patient outcome data for all patients (all-payer data) provided by 19 individual states for years 2006 through 2008. Ratings were based on HealthGrades' risk-adjustment methodology, and the HealthGrades ratings are available on the web at www.HealthGrades.com.

The purpose of risk adjustment is to obtain fair statistical comparisons among disparate populations or groups. Significant differences in demographic and clinical risk factors are found among patients treated in different hospitals. Risk adjustment of the data is needed to make accurate and valid comparisons of clinical outcomes at different hospitals.

Data Acquisition

For the bariatric surgery hospital ratings, all-payer state data were used in those states where state data are available. For multivariate logistic regression-based ratings (see below), HealthGrades conducted a series of data quality checks to preserve the integrity of the ratings. Based on the results of these checks, we excluded a limited number of cases because they were inappropriate for inclusion in the database or miscoded.

Examples of excluded patient records were:

- Patients who left the hospital against medical advice or who were transferred to another acute care hospital.
- Patients who were still in the hospital when the claim was filed.

Multivariate Logistic Regression-Based Ratings

The initial analysis of the data utilized 19 states of all-payer data from 2006 through 2008. Bariatric surgery patients were identified by their ICD-9 principal procedure of a bariatric surgical procedure and a principal diagnosis of obesity/morbid obesity (see *Bariatric Surgery Cohort and Related ICD-9-Codes* below)—a definition previously described by Santry et al.¹ Patients under the age of 18 were excluded.

For this population, potential risk factors and the outcome measure (complications) were then defined.

1. Potential risk factors were defined as all clinically relevant diagnoses occurring in more than 0.5 percent of the patients. In addition, patient demographic factors such as age, gender and the specific procedure performed on the patient were also considered. Some diagnosis codes were merged together (e.g., primary and secondary pulmonary hypertension) to minimize the impact of coding variations.
2. Complications were identified using previous peer-reviewed research^{1,2} and through input from clinical and coding experts.

In some cases, an ICD-9 code can be either a risk or a complication. In these cases, a code is differentiated by the presence or absence of a 900 post-operative complication code. For example, in the case where a patient record contains "427.31 Atrial Fibrillation," that code is considered a risk if it occurs by itself and a complication if there is a corresponding "997.1 Cardiac Complications NEC" code also present in the patient record. Outcomes were binary, with documented major complications either present or not. Mortality is considered a major complication. See *Bariatric Surgery Major Complications* below for the list of major complications.

Bariatric Surgery Cohort and Related ICD-9 Codes

Principal Procedures and Diagnoses – Inclusions

Procedure 43.89, 44.31, 44.38, 44.39, 44.68, 44.95, or 45.91

Diagnosis 278.00 (obesity), 278.01 (morbid obesity) (must have one of these diagnosis codes along with one of the listed procedures)

Procedures – Exclusions

44.5, 44.94, 44.96, 44.97

For a complete list of the over 300 diagnosis exclusion codes, please see the *Hospital Report Cards™ Bariatric Surgery Methodology* at www.HealthGrades.com.

Demographic – Exclusions

Patients under the age of 18 years

Bariatric Surgery Major Complications

Major Complications – Bariatric Surgery

Respiratory Complications

31.1, 31.29, 482.0, 482.1, 482.2, 482.30, 482.31, 482.32, 482.39, 482.40, 482.41, 482.49, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483.0, 483.1, 483.8, 484.3, 484.5, 518.0, 518.5, 518.7, 518.81, 997.3

Cardiac Complications

410.01, 410.11, 410.21, 410.31, 410.41, 410.51, 410.61, 410.71, 410.81, 410.91, 415.11, 415.12, 415.19, 427.0, 427.1, 427.31, 427.41, 427.89, 997.1

Urinary Complications/Acute Renal Failure

39.95, 584.5, 584.8, 584.9, 997.5

Splenic Injury

41.2, 41.43, 41.5, 41.95

Pulmonary/Venous Embolism

415.11, 415.12, 415.19, 453.8, 453.9

Stroke

433.00, 433.01, 433.10, 433.11, 433.20, 433.21, 433.30, 433.31, 433.80, 433.81, 433.90, 433.91, 434.00, 434.01, 434.10, 434.11, 434.90, 434.91, 437.1

Digestive System Complications

560.0, 560.1, 560.2, 560.30, 560.39, 560.81, 560.89, 560.9, 997.4, 998.6

Hemorrhage/Surgical Wound Complications

44.61, 54.12, 54.61, 54.91, 54.92, 998.0, 998.11, 998.12, 998.2, 998.30, 998.31, 998.32

Post-Operative Infections

038.0, 038.10, 038.11, 038.19, 038.2, 038.3, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9, 998.51, 998.59

For more details regarding the specific ICD-9 codes identified as complications, please see the *Hospital Report Cards™ Bariatric Surgery Methodology* at www.HealthGrades.com.

Developing HealthGrades Bariatric Surgery Ratings

Developing the HealthGrades Bariatric Surgery ratings involved four steps.

1. First, for each hospital, the predicted value (predicted number of complications) was obtained using a logistic regression model discussed in the next section.
2. Second, the predicted value was compared with the actual or observed number of complications. Only hospitals with at least 30 cases across three years of data and at least five cases in the most current year were included.
3. Third, a test was conducted to determine whether the difference between the predicted and actual values was statistically significant. This test was performed to make sure that differences were very unlikely to be caused by chance alone.

4. Fourth, a star rating was assigned based upon the outcome of the statistical test.

The following rating system was applied to the data for all procedures and diagnoses:

- ★★★★★ **Best** – Actual performance was better than predicted and the difference was statistically significant.
- ★★★ **As Expected** – Actual performance was not significantly different from what was predicted.
- ★ **Poor** – Actual performance was worse than predicted and the difference was statistically significant.

Statistical Models

Using the list of potential risk factors, we used logistic regression to determine to what extent each one was correlated with the quality measure (complications). A risk factor stayed in the model if it had an odds ratio greater than one (except clinically relevant procedures, cohort defining principal diagnoses, and some protective factors as documented in the medical literature were allowed to have an odds ratio less than one) and was also statistically significant ($p < 0.05$).

Complications were *not* counted as risk factors as they were considered a result of care received during the admission. Risk factors are those diagnoses that are the most highly correlated with the outcome studied (complications). The most highly correlated risk factors are not necessarily those with the highest volume.

Top Five Risk Factors

ICD-9 Diagnosis or Procedure Code	Description
Proc 44.69	OTHER REPAIR OF STOMACH
Proc 44.39	OTHER GASTROENTEROSTOMY WITHOUT GASTRECTOMY
Diag 518.0	PULMONARY COLLAPSE
Proc 44.31	HIGH GASTRIC BYPASS
Diag v64.41	LAPAROSCOPIC SURGICAL PROCEDURE CONVERTED TO OPEN PROCEDURE

The statistical model was checked for validity and finalized. The final model was highly significant, with a C-statistic of 0.692. This model was then used to estimate the probability of a complication for each patient in the cohort. Patients were then aggregated for each hospital to obtain the predicted number of complications for each hospital. Statistical significance tests were performed to identify, by hospital, whether the actual and predicted rates were significantly different.

Limitations of the Data Models

It must be understood that while these models may be valuable in identifying hospitals that perform better than others, one should not use this information alone to determine the quality of care provided at each hospital. The models are limited by the following factors:

- Cases may have been coded incorrectly or incompletely by the hospital.
- The models can only account for risk factors that are coded into the billing data—if a particular risk factor was not coded into the billing data, such as a patient's socioeconomic status and health behavior, then it was not accounted for with these models.

- Although Health Grades, Inc. has taken steps to carefully compile these data using its methodology, no techniques are infallible, and therefore some information may be missing, outdated or incorrect.

Please note that a high ranking for a particular hospital is not a recommendation or endorsement by Health Grades, Inc. of a particular hospital; it means that the data associated with a particular hospital has met the foregoing qualifications. Only individual patients can decide whether a particular hospital is suited for their unique needs.

Also note that if more than one hospital reported to CMS under a single provider ID, HealthGrades analyzed patient outcomes data for those hospitals as a single unit. Throughout this document, therefore, “hospital” refers to one hospital or a group of hospitals reporting under a single provider ID.

Methodology References

- 1 Santry HP, Gillen DL, Lauderdale DS. Trends in bariatric surgical procedures. JAMA. 2005;294:1909-1917.
- 2 Nguyen NT, Paya M, Stevens CM, et al. The relationship between hospital volume and outcome in bariatric surgery at academic medical centers. Ann of Surg. 2004;240(4):586-594.
- 3 Buchwald, H. et al., Bariatric Surgery: A Systematic Review and Meta-Analysis. JAMA. 2004; 92: 1724–1737.