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BARIATRIC SURGERY OUTCOMES : SYSTEMATIC REVIEW IN LITERATURE

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Abstract:
This review is aiming to discuss the bariatric surgery outcomes. The present review was conducted by searching in Medline, Embase, Web of Science, Science Direct, BMJ journal and Google Scholar for, researches, review articles and reports, published over the past years. Books published on bariatric surgery outcomes. If several studies had similar findings, we randomly selected one or two to avoid repetitive results. Based on findings and results this review is Charges and comorbidities were greatest in African Americans and Hispanics compared to Caucasians. Medicare and Medicaid-insured patients have higher LOS, charges, comorbidities, morbidity, and mortality compared to privately insured and self-pay patients. Lower income patients have higher LOS and total charges. Nonteaching hospitals have an increased LOS and charges and treat patients with more comorbidities compared to teaching hospitals. Centers of excellence performed substantially more operations than non-designated centers. Despite this, outcomes were equivalent at centers of excellence and hospitals without this designation. Volume-outcome modeling attempting to identify the optimal number for a minimum volume threshold for bariatric operations revealed that annual procedure volume has a weak effect on outcomes.

Keywords: *Bariatric, Surgery, Outcomes*

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INTRODUCTION:

Bariatric surgery (or weight loss surgery) includes a variety of procedures performed on people who have obesity. Weight loss is achieved by reducing the size of the stomach with a gastric band or through removal of a portion of the stomach (sleeve gastrectomy or biliopancreatic diversion with duodenal switch) or by resecting and re-routing, the small intestine to a small stomach pouch (gastric bypass surgery). [1]

Long-term studies show the procedures cause significant long-term loss of weight, recovery from diabetes, improvement in cardiovascular risk factors, and a mortality reduction from 40% to 23%. [1] The U.S. National Institutes of Health recommends

bariatric surgery for obese people with a body mass index (BMI) of at least 40, and for people with BMI of at least 35 and serious coexisting medical conditions such as diabetes. [2] However, research is emerging that suggests bariatric surgery could be appropriate for those with a BMI of 35 to 40 with no comorbidities or a BMI of 30 to 35 with significant comorbidities. The most recent American Society for Metabolic & Bariatric Surgery guidelines suggest the position statement on consensus for BMI as an indication for bariatric surgery. The recent guidelines suggest that any patient with a BMI of more than 30 with comorbidities is a candidate for bariatric surgery. [3]

A National Institute of Health symposium held in 2013 that summarized available evidence found a 29% mortality reduction, a 10-year remission rate of Type 2 Diabetes of 36%, fewer cardiovascular events, and a lower rate of diabetes-related complications in a long-term, non-randomized, matched intervention 15-20 year follow-up study, the Swedish Obese Subjects Study.[3] The symposium also found similar results from a Utah study using more modern gastric bypass techniques, though the follow-up periods of the Utah studies are only up to 7 years. While randomized controlled trials of bariatric surgery exist, they are limited by short follow-up periods. [4]

METHODS:

The present review was conducted Jan 2019 in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) declaration standards for systematic reviews. We reviewed all the topics on bariatric surgery outcomes. To achieve this goal, we searched Medline, EMBASE, Web of Science, Science Direct, and Google Scholar for, researches, review articles and reports, published over the past 15 years. Books published on bariatric surgery outcomes. Our search was completed without language restrictions. Then we extracted data on study year, study design, and key outcome of bariatric surgery. The selected studies were summarized, and unreproducible studies were excluded. Selected data are shown in the Table 1.

Inclusion criteria

We included studies of consecutive patients' representative of the Bariatric surgery population. The participants were adults who had undergone Bariatric surgery.

Exclusion criteria

Non-relating articles were discarded, while additional articles reporting on treatments were excluded.

Data extraction and analysis

Information relating to each of the systematic review elements was extracted from the studies and collated in qualitative tables. Direct analysis of the studies of bariatric surgery outcomes is done with extreme caution, as different sampling techniques can provide bias as an overview of the assemblage.

RESULTS:

Electronic literature search of MEDLINE, Current Contents, and the Cochrane Library databases plus manual reference checks of all articles on bariatric surgery published in the English language between 1990 and 2003. Two levels of screening were used on 2738 citations. [5]

Data Extraction A total of 136 fully extracted studies, which included 91 overlapping patient populations (kin studies), were included for a total of 22 094 patients. Nineteen percent of the patients were men and 72.6% were women, with a mean age of 39 years (range, 16-64 years). Sex was not reported for 1537 patients (8%). The baseline mean body mass index for 16 944 patients was 46.9 (range, 32.3-68.8). [5]

Data Synthesis A random effects model was used in the meta-analysis. The mean (95% confidence interval) percentage of excess weight loss was 61.2% (58.1%-64.4%) for all patients; 47.5% (40.7%-54.2%) for patients who underwent gastric banding; 61.6% (56.7%-66.5%), gastric bypass; 68.2% (61.5%-74.8%), gastroplasty; and 70.1% (66.3%-73.9%), biliopancreatic diversion or duodenal switch. Operative mortality (≤30 days) in the extracted studies was 0.1% for the purely restrictive procedures, 0.5% for gastric bypass, and 1.1% for biliopancreatic diversion or duodenal switch. Diabetes was completely resolved in 76.8% of

patients and resolved or improved in 86.0%. Hyperlipidemia improved in 70% or more of patients. Hypertension was resolved in 61.7% of patients and resolved or improved in 78.5%. Obstructive sleep apnea was resolved in 85.7% of patients and was resolved or improved in 83.6% of patients. [5]

Bariatric surgery is one of the fastest growing hospital procedures, but with a 40% complication rate in 2001. Between 2001 and 2005 bariatric surgeries grew by 113%. Our objective is to examine how 6-month complications improved between 2001 and 2006, using a nationwide, population-based sample. Data/Design: We examined insurance claims in 2001-2002 and 2005-2006 for 9582 bariatric surgeries, at 652 hospitals, among a population of 16 million nonelderly people. Outcomes and costs were risk-adjusted using multivariate regression methods with hospital fixed effects. Principal Findings: Between 2001 and 2006, while older and sicker patients underwent the surgery, the 180-day risk-adjusted complication rate declined 21% from 41.7% to 32.8%. Most of the improvement was in the initial hospital stay, where the risk-adjusted inpatient complication rate declined 37%, from 23.6% to 14.8%. Risk-adjusted rates of readmissions with complications declined 31%, from 9.8% to 6.8%. Risk-adjusted hospital days declined from 6 to 3.7 days, and risk-adjusted and inflation-adjusted payments declined 6%. Improvements in complication rates and readmission rates were associated with a within-hospital 30% increase in hospital volume. Volume had no impact on costs. The use of laparoscopy, which increased from 9% to 71%, reduced costs by 12%, while gastric banding decreased costs by 20%. Laparoscopy had no impact on readmissions, but the increase in banding without bypass reduced readmissions. [6]

The influence of patient and hospital demographics on gastric bypass (GB) outcomes is unknown. We analyzed year 2000 data from the Nationwide Inpatient Sample database for all GB patients. In 2000, 5876 GB were performed in the 137 sample hospitals (M:F, 14%: 86%). Length of stay (LOS, days), charges, comorbidities, and morbidity were higher for those aged >60 years compared to <40 years. LOS, charges, comorbidities, morbidity, and mortality were highest in males. LOS was longest in African Americans compared to Caucasians and Hispanics. Charges and comorbidities were greatest in African Americans and Hispanics compared to Caucasians. Medicare and Medicaid-insured patients have higher LOS, charges, comorbidities, morbidity, and mortality compared to privately insured and self-pay patients. Lower income patients have higher LOS and total charges. Nonteaching hospitals have an increased LOS and charges and treat patients with more comorbidities compared to teaching hospitals. LOS, charges, and morbidity are directly proportional to hospital size. Urban hospitals have lower LOS and higher charges compared to rural hospitals. As hospital GB volume increases, LOS, charges, and morbidity decrease with no mortality effect. After controlling for all other covariates, male gender, increased age, and large hospital size were predictors of increased morbidity. Having had a complication predicted increased mortality, while female gender had a protective effect. [7]

We assessed outcomes 3 years after the randomization of 150 obese patients with uncontrolled type 2 diabetes to receive either intensive medical therapy alone or intensive medical therapy plus Roux-en-Y gastric bypass or sleeve gastrectomy. The primary end point was a glycated hemoglobin level of 6.0% or less.

The mean (±SD) age of the patients at baseline was 48±8 years, 68% were women, the mean baseline glycated hemoglobin level was 9.3±1.5%, and the mean baseline body-mass index (the weight in kilograms divided by the square of the height in meters) was 36.0±3.5. A total of 91% of the patients completed 36 months of follow-up. At 3 years, the criterion for the primary end point was met by 5% of the patients in the medical-therapy group, as compared with 38% of those in the gastric-bypass group (P<0.001) and 24% of those in the sleeve-gastrectomy group (P=0.01). The use of glucose-lowering medications, including insulin, was lower in the surgical groups than in the medical-therapy group. Patients in the surgical groups had greater mean percentage reductions in weight from baseline, with reductions of 24.5±9.1% in the gastric-bypass group and 21.1±8.9% in the sleeve-gastrectomy group, as compared with a reduction of 4.2±8.3% in the medical-therapy group (P<0.001 for both comparisons). Quality-of-life measures were significantly better in the two surgical groups than in the medical-therapy group. There were no major late surgical complications. [8]

Centers of excellence performed substantially more operations than no designated centers. Despite this, outcomes were equivalent at centers of excellence and hospitals without this designation. Volume-outcome modeling attempting to identify the optimal number for a minimum volume threshold for bariatric operations revealed that annual procedure volume has a weak effect on outcomes. Similarly, many variables that were statistically significantly different between

centers and non-centers proved to be clinically unimportant by effect size analysis. Risk adjustment was effectively achieved by using the Agency for Healthcare Research and Quality–supplied variables all-payer severity-adjusted diagnostic related group expected charges and deaths. [9]

Table (1) Results from Sequencing Studies.

Authors	Design	Population	Main Results
Buchwald et al (2004)[5]	Systemic review	36 fully extracted studiesA total of 22 094 patients.	A random effects model was used in the meta-analysis. The mean (95% confidence interval) percentage of excess weight loss was 61.2% (58.1%-64.4%) for all patients; 47.5% (40.7%-54.2%) for patients who underwent gastric banding; 61.6% (56.7%-66.5%), gastric bypass; 68.2% (61.5%-74.8%), gastroplasty; and 70.1% (66.3%-73.9%), biliopancreatic diversion or duodenal switch. Operative mortality (≤30 days) in the extracted studies was 0.1% for the purely restrictive procedures, 0.5% for gastric bypass, and 1.1% for biliopancreatic diversion or duodenal switch. Diabetes was completely resolved in 76.8% of patients and resolved or improved in 86.0%. Hyperlipidemia improved in 70% or more of patients. Hypertension was resolved in 61.7% of patients and resolved or improved in 78.5%. Obstructive sleep apnea was resolved in 85.7% of patients and was resolved or improved in 83.6% of patients.
Encinosa et al (2009).[6]	a nationwide, population-based sample. Data/Design: We examined insurance claims in 2001-2002 and 2005-2006	9582 bariatric surgeries, at 652 hospitals, among a population of 16 million nonelderly people	Between 2001 and 2006, while older and sicker patients underwent the surgery, the 180-day risk-adjusted complication rate declined 21% from 41.7% to 32.8%. Most of the improvement was in the initial hospital stay, where the risk-adjusted inpatient complication rate declined 37%, from 23.6% to 14.8%. Risk-adjusted rates of readmissions with complications declined 31%, from 9.8% to 6.8%. Risk-adjusted hospital days declined from 6 to 3.7 days, and risk-adjusted and inflation-adjusted payments declined 6%. Improvements in complication rates and readmission rates were associated with a within-hospital 30% increase in hospital volume. Volume had no impact on costs. The use of laparoscopy, which increased from 9% to 71%, reduced costs by 12%, while gastric banding decreased costs by 20%. Laparoscopy had no impact on readmissions, but the increase in banding without bypass reduced readmissions.

Carbonell et al (2005)[7]	Nationwide Inpatient Sample database for all GB patients.	5876 GB were performed in the 137 sample hospital	Charges and comorbidities were greatest in African Americans and Hispanics compared to Caucasians. Medicare and Medicaid-insured patients have higher LOS, charges, comorbidities, morbidity, and mortality compared to privately insured and self-pay patients. Lower income patients have higher LOS and total charges. Nonteaching hospitals have an increased LOS and charges and treat patients with more comorbidities compared to teaching hospitals. LOS, charges, and morbidity are directly proportional to hospital size. Urban hospitals have lower LOS and higher charges compared to rural hospitals. As hospital GB volume increases, LOS, charges, and morbidity decrease with no mortality effect. After controlling for all other covariates, male gender, increased age, and large hospital size were predictors of increased morbidity. Having had a complication predicted increased mortality, while female gender had a protective effect. Patient income, insurance status, and race did not play a role in morbidity or mortality.
Philip etal (2014)	short-term randomized trials	150 obese patients with uncontrolled type 2 diabetes	The mean (±SD) age of the patients at baseline was 48±8 years, 68% were women, the mean baseline glycated hemoglobin level was 9.3±1.5%, and the mean baseline body-mass index (the weight in kilograms divided by the square of the height in meters) was 36.0±3.5. A total of 91% of the patients completed 36 months of follow-up. At 3 years, the criterion for the primary end point was met by 5% of the patients in the medical-therapy group, as compared with 38% of those in the gastric-bypass group (P<0.001) and 24% of those in the sleeve-gastrectomy group (P=0.01). The use of glucose-lowering medications, including insulin, was lower in the surgical groups than in the medical-therapy group. Patients in the surgical groups had greater mean percentage reductions in weight from baseline, with reductions of 24.5±9.1% in the gastric-bypass group and 21.1±8.9% in the sleeve-gastrectomy group, as compared with a reduction of 4.2±8.3% in the medical-therapy group (P<0.001 for both comparisons).Quality-of-life measures were significantly better in the two surgical groups than in the medical-therapy group. There were no major late surgical complications.

Livingston EH. (2009)[9]	The National Inpatient Survey was used to compare outcomes at designated vs non designated hospitals.	Designated Centers of Excellence vs Non designated Programs	Centers of excellence performed substantially more operations than non designated centers. Despite this, outcomes were equivalent at centers of excellence and hospitals without this designation. Volume-outcome modeling attempting to identify the optimal number for a minimum volume threshold for bariatric operations revealed that annual procedure volume has a weak effect on outcomes. Similarly, many variables that were statistically significantly different between centers and noncenters proved to be clinically unimportant by effect size analysis. Risk adjustment was effectively achieved by using the Agency for Healthcare Research and Quality–supplied variables all-payer severity-adjusted diagnostic related group expected charges and deaths.

DISCUSSION:

These data show that Patient income, insurance status, and race did not play a role in morbidity or mortality. Neither academic, teaching status of the hospital or hospital gastric bypass volume influenced patient outcomes. Patient and hospital demographics do affect the outcomes of patients undergoing GB. Increasing age, male gender, and surgery performed in large hospitals are predictors of morbidity. Male gender and postoperative complications predict increased mortality. Neither comorbidities, race, payer, income, hospital academic status, location, nor hospital volume affect the outcome after GB.

Metabolic and weight-loss outcomes were generally similar in the two surgical groups at 1 year, although some advantages of gastric bypass over sleeve gastrectomy have emerged during longer follow-up, including a greater likelihood of reaching a glycated hemoglobin level of 7.0% or less (a therapeutic goal of the American Diabetes Association) with no use of diabetes medications, a reduced requirement for diabetes and cardiovascular medications, greater reductions in weight and BMI, and a greater improvement in quality of life. Some differences between the gastric-bypass group and the sleeve-gastrectomy group did not reach statistical significance, although the study was not adequately powered to detect modest differences between these procedures. In a prespecified sub study analysis of beta-cell function, insulin sensitivity, and body composition in a subgroup of patients, we found that at 2 years, gastric bypass was superior to sleeve gastrectomy with respect to insulin secretion, insulin sensitivity, and relative reduction in truncal fat as compared with subcutaneous fat. [10]

Designation as a bariatric surgery COE requires a significant amount of personnel and infrastructure support. All COEs must have a bariatric surgery coordinator, personnel dedicated to data entry into proprietary databases, personnel devoted to following up patients' long term, and subscription to one of the database services used to track bariatric surgery outcomes. No evidence exists that these program structural elements translate to better outcomes. Criteria such as entry of outcomes data into proprietary databases result in substantial program costs yet do not have a clear relationship to surgical outcomes. Neither the American Society for Metabolic and Bariatric Surgery bariatric outcomes longitudinal database nor the American College of Surgeons National Surgical Quality Improvement Program databases have been shown to improve bariatric surgery outcomes. Assumptions have been made that use of these databases will mimic the successes of the US Department of Veterans Affairs National Surgical Quality Improvement Program experience. This is not likely, because the Department of Veterans Affairs oversees a self-contained health care system that has a central authority with the ability to intervene in underperforming surgical programs, a process not possible in the private sector. In an era where most hospitals have operational deficits and physician reimbursement is falling, requiring additional costs in the name of improved quality should only be imposed if those expenses can be irrefutably justified by their benefit in terms of improved outcomes. The present study suggests that expenses related to the structural elements required to achieve bariatric surgery COE status may not be justified. [9]

CONCLUSIONS:

In conclusion, we observed that effective weight loss was achieved in morbidly obese patients after undergoing bariatric surgery. A substantial majority of patients with diabetes, hyperlipidemia, hypertension, and obstructive sleep apnea experienced complete resolution or improvement. Improvements in bariatric outcomes and costs were due to a mix of within-hospital volume increases, a move to a laparoscopic technique, and an increase in banding without bypass. Among obese patients with uncontrolled type 2 diabetes, 3 years of intensive medical therapy plus bariatric surgery resulted in glycemic control in significantly more patients than did medical therapy alone. Analyses of secondary end points, including body weight, use of glucose-lowering medications, and quality of life, also showed favorable results at 3 years in the surgical groups, as compared with the group receiving medical therapy alone.

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