**PICO Search Assignment Worksheet**

**Brief description of patient problem/setting (summarize the case very briefly):**

A 61 year old woman with PMH of OSA and diabetes comes to the office for a gastric sleeve operation after several attempts of trying to lose weight and failing every time. She was scheduled for a gastric sleeve procedure as she was told that this was the best initial step for weight loss.

**Search Question**: clearly state question, including outcomes or criteria to be tracked

 Is gastric sleeve more effective than Roux-en-Y gastric bypass in achieving weight loss goals over time?

**Question Type:** What kind of question is this? (boxes now checkable in Word)

Prevalence Screening Diagnosis

Prognosis Treatment Harms

Assuming that the highest level of evidence to answer your question will be meta-analysis or systematic review, what other types of study might you include if these are not available (or if there is a much more current study of another type)? Please explain your choices.

Other than meta-analysis, I would also want to search for randomized controlled trials as well as retrospective/prospective studies in efforts to have a better understanding of long-lasting effects of gastric sleeve vs Roux-en-Y gastric bypass.

**PICO search terms:**

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| **P** | **I** | **C** | **O** |
| Morbidly obese patients | Gastric sleeve | Roux-en- y gastric bypass | Weight loss |
| Patients undergoing bariatric surgery | Laparoscopic gastric sleeve | Laparoscopic Roux-en-Y gastric bypass |  Maintained weight loss |
|  |   |   |  Weight loss goals |
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**Search tools and strategy used:**

Please indicate what databases/tools you used, provide a list of the terms you searched together in each tool, and how many articles were returned using those terms and filters.

Explain how you narrow your choices to the few selected articles.

**Filters/limits applied:**

1. Recent publications within the past 10 years
2. Review
3. Full Article
4. Journal

**Databases used:**

1. PubMed
2. ScienceDirect
3. Google Scholar

**Results found:**

**Number of articles returned once relevant limits are added**

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| **Database** | **Filter** | **Terms Searched** | **Articles Returned** |
| **PubMed** | English/Last 20 years/Full Text/Full Article/ | Gastric sleeve vs Roux-en-Y in achieving weight loss goal | **359** |
| Efficacy of Laparoscopic gastric sleeve vs laparoscopic roux-en-y in weight loss | **1335** |
| **ScienceDirect** | English/ 2002-2022/ Research Articles | Gastric sleeve vs Roux-en-Y in achieving weight loss goal | 376 |
| Efficacy of Laparoscopic gastric sleeve vs laparoscopic roux-en-y in weight loss | 596 |
| **Google Scholar** | 2002-2022/Include patents/Include Citations | Gastric sleeve vs Roux-en-Y in achieving weight loss goal | **5,510** |
| Efficacy of Laparoscopic gastric sleeve vs laparoscopic roux-en-y in weight loss | 5,280 |

I narrowed down my results to articles that directly addressed my research question. I wanted to specifically compare the efficacy of laparoscopic gastric sleeve with laparoscopic Roux-en-y gastric bypass to see which had more long-lasting effects. I chose to use a combination of meta-analysis studies as well as systematic analysis and retrospective studies. These study designs have a high level of evidence with minimal bias.

**Results found:**

Identify at least 3 articles (or other appropriate reputable sources) that answer your specific question with the highest available level of evidence (you will probably need to look at more than 3 articles to get the 3 most focused and highest level articles to address your question). Please make sure that they are Medline indexed. In addition to providing the hyperlinks, the full-length articles (PDFs) must also be attached in Blackboard.

Please post the citation and abstract for each article (to include the journal and authors’ names and date) and say why you chose it. Please also note what kind of article it is (e.g. meta-analysis, cohort study, or independent blind comparison with gold standard of diagnosis, etc.).

At the bottom of each abstract, please comment on what your key points are from this article (including any points or concepts included in the article, but not present in the abstract – i.e. make the concepts understandable to the reader). Please note that if the evidence is not in the abstract, you must clearly summarize the evidence in your posting.

# **Article 1**

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| **Citation**: Guraya, S. Y., & Strate, T. (2019). Effectiveness of laparoscopic roux-en-Y gastric bypass and sleeve gastrectomy for morbid obesity in achieving weight loss outcomes. *International Journal of Surgery*, *70*, 35–43. https://doi.org/10.1016/j.ijsu.2019.08.010  |
| **Type of Study: Systematic Review and Meta-analysis** |
| **Abstract**:**Background** Laparoscopic Roux-en-Y gastric bypass and laparoscopic sleeve gastrectomy are commonly performed weight loss procedures worldwide. Unfortunately, few studies have compared percentage total weight loss (%TWL) following these procedures. This research compared short-term, mid-term, and long-term % TWL by LRYGB and LSG**Method**Selected databases were searched for original articles that compared %TWL by LSG and LRYGB. Review manager 5.3 was used for data analysis. Effect summary was presented by forest plot **Results** A significantly better % TWL in 5 years was shown by LRYGB than LSG; pooled mean difference (MD) 1.87. Subgroup analysis showed better % TWL by LRYGB than LSG at 24 months pooled MD 6.47, however, better %TWL by LRYGB than LSG was noted after 36 months. Finally, significant better % TWL was noted for LRYGB at 60 months**Conclusion** This study shows %TWL of 70.4% by LRYGB and 59.8% following LSG in at least half of patients from selected cohort. A significantly greater % TWL by LRYGB in short and long term, while higher % TWL by LSG in mid-term is reported |
| **Reason for Selection: I chose this systematic review and meta-analysis study because it directly answers my research question, it is a recent study (2019). These studies also have high levels of evidence within minimal bias.** |
| **Key Points:*** This systematic review and meta-analysis of 4.742 patients provides a reliable quantitative data that shows significantly better %TWL outcomes by LRYGB in short term and long term
* This study also points out that delicate balance between foregut and hindgut hormones might play vital roles in achieving %TWL following LSG and LRYGB.
* This systematic review and meta-analysis showed heterogeneity of results—at the same time, variations in surgical technicalities of the two procedures might have some implications on this research finding
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# **Article 2**

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| **Citation**: Shenoy, S.S., Gilliam, A., Mehanna, A. *et al.* Laparoscopic Sleeve Gastrectomy Versus Laparoscopic Roux-en-Y Gastric Bypass in Elderly Bariatric Patients: Safety and Efficacy—a Systematic Review and Meta-analysis. *OBES SURG* **30**, 4467–4473 (2020). https://doi.org/10.1007/s11695-020-04819-3 |
| **Type of Study: Systematic Review and Meta-analysis** |
| **Abstract**:**Background** Obesity is a chronic disease due to excess fat storage, a genetic predisposition, and environmental contribution where surgery offers a viable treatment option. The surgical treatment of obesity in the elderly population (>55 years) remains controversial. To evaluate the safety and efficacy of laparoscopic sleeve gastrectomy (LSG) and laparoscopic Roux-en-Y gastric bypass (LRYGB) in elderly bariatric patients. The purpose of this procedure is to evaluate the safety and efficacy of laparoscopic sleeve gastrectomy and laparoscopic Roux-en-Y gastric bypass in elderly bariatric patients.  **Method**Data was sourced from MEDLINE, EMBASE, CINAHL, PubMed, and Cochrane databases for peer-reviewed, randomized controlled trials, and observational studies in the English language were searched from the year 1991 until 2019. From the extracted data, early and late procedural complications and mortality were used as safety outcomes. Weight loss was the primary outcome for effectiveness while the resolution of obesity-related comorbidities was included as secondary outcomes. The Review Manager software was used for statistical analysis**Results**Of the 41 screened studies, nine studies were included in the final analysis. There was no difference between LSG and LRYGB regarding early complications and mortality 3.6% versus 5.8% and 0.1% versus 0.8%. Patients who underwent LRYGB had more late complications compared with those who underwent LSG. There was no difference in terms of weight loss at the end of 1 year. Patients who underwent LRYGB had a better resolution of obesity-related comorbidities, not statistically significant **Conclusion**LRYGB has better efficacy when compared with LSG. However, high-risk elderly patietns should be considered for LSG given the lesser morbidity and comparable efficacy with LRYGB. |
| **Reason for Selection: I wanted to extend my research population to include elderly patients as well- since most patients who receive this procedure tend to be on the older side. This study has the potential to strengthen the arguments of the articles that I found. This study also looked at outcomes related to diabetes and HTN as well. Additionally, this study is also a systematic review and meta-analysis making it high in evidence.** |
| **Key Points:*** Analysis of the data revealed that patients who underwent RYGB lost more weight compared to those who underwent LSG, though not statistically significant
* The study revealed that there was no statistically significant difference between the two procedures for early major peri-operative complications
* The increased incidence of early morbidity among patients who undergo RYGB could be attributed to the longer operative time or the need for increased technical skills involved with the procedure—prolonged operative times are associated with an increased incidence of wound infection and pulmonary and cardiac complications, and technique of gastric bypass involves a significant learning curve with the fashioning of the anastomotic limbs and the use of stapling devices
* Patients who underwent LSG were significantly less likely to develop late complications
* Even with low complication rates, LSG is not a risk-free operation; associated with hazardous complications like leakage at the GE junction
* LSG is recommended for patients who have associated inflammatory bowel disease or patients who need a staged concept or expected to have major adhesions undergo LSG
* Randomized studies with long-term follow-up rates on the safety and efficacy of the two procedures are essential to determine the gold standard procedure in the elderly population
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**Article 3:**

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| **Citation**:Li, J., Lai, D. & Wu, D. Laparoscopic Roux-en-Y Gastric Bypass Versus Laparoscopic Sleeve Gastrectomy to Treat Morbid Obesity-Related Comorbidities: a Systematic Review and Meta-analysis. *OBES SURG* **26**, 429–442 (2016). https://doi.org/10.1007/s11695-015-1996-9 |
| **Type of Study: Systematic review and Meta analysis** |
| **Abstract**:**Background**The aim was to compare laparoscopic Roux-en-Y gastric bypass and laparoscopic sleeve gastrectomy for treating morbid obesity and its related comorbidities. **Method**Electronic literature search using PubMed, EMBASE, Wanfang, and China National Knowledge Infrastructure databases from inception to May 2015, using the terms “gastric bypass”, “sleeve gastrectomy”, and “obesity”. Two independent investigators reviewed all articles based on the following selection and inclusion criteria: (1) randomized controlled trials, controlled clinical trials, and cohort studies or retrospective observational studies regardless of publication date; (2) surgical treatment with LRYGB or LSG; and (3) adult populations only (>18 years of age) and BMI > 35 kg/m^2. Exclusion criteria included (1) non-human studies, (2) non-surgical interventions, (3) letters and comments, and (4) unreliable design or obvious statistical errors as evaluated by two independent investigators. **Results** The initial database search retrieved 849 publications, and 62 eligible publications met the inclusion criteria. All 62 studies were published after 2008 and included a total of 18,449 patients. Among these patients, 10,498 underwent LRYGB and 7,951 underwent LSG. The sample size of these trials ranged from 12 to 5,898 patients. The **Conclusion** Patients receiving LRYGB had a significantly higher percentage of excess weight loss and better resolution of hypertension, dyslipidemia, GERD, and arthritis compared with those receiving LSG. LRYGB and LSG showed similar effects on type 2 diabetes and sleep apnea.  |
| **Reason for Selection: I chose this study because not only are these bariatric surgeries done to lose weight, but to also resolve obesity-related comorbidities such as diabetes and OSA. This study assesses these areas.** |
| **Key Points:*** Currently, LRYGB is considered the gold standard procedure for morbid obesity, resulting in excellent long-term sustained weight loss and remarkable resolution of comorbidities.
* LRYGBs resulted in greater weight loss than LSG and that LRYGB had better efficacy for resolving hypertension, dyslipidemia, GERD, and arthritis
* Although LRYGB more effectively resolves obesity-related comorbidities, LSG remains an option for treating morbid obesity, especially for those patients without obesity-related comorbidities
* LSG is easier and faster procedure to perform—no need for anastomosis or resulting mesenteric defects
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 Article 4

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| **Citation**: Praveenraj, P., Gomes, R. M., Kumar, S., Perumal, S., Senthilnathan, P., Parthasarathi, R., Rajapandian, S., & Palanivelu, C. (2016). Comparison of weight loss outcomes 1 year after sleeve gastrectomy and roux-en-Y gastric bypass in patients aged above 50 years. *Journal of Minimal Access Surgery*, *12*(3), 220. https://doi.org/10.4103/0972-9941.183481  |
| **Type of Study: Retrospective Analysis** |
| **Abstract**: **Background**Safe, effective weight loss with resolution of comorbidities has been convincingly demonstrated with bariatric surgery in the aged obese. They, however, lose less weight than younger individuals. It is not known if degree of weight loss is influenced by the choice of bariatric procedure. The aim of this study was to prepare the degree of weight loss between laparoscopic sleeve gastrectomy (LSG) and laparoscopic Roux-en-Y gastric bypass (LRYGB) in patients above the age of 50 years at 1 year after surgery**Method** A retrospective analysis was performed of all patients more than 50 years of age who underwent LSG or LRYGB between February 2012 and July 2013 with at least 1 year of follow up. Data evaluated at 1 year included age, sex, weight, body mass index, mean operative time, percentage of weight loss and excess weight loss, resolution/ remission of diabetes, morbidity, and mortality**Results**Of a total of 86 patients, 53 underwent LSG and 32 underwent LRYGB. The mean percentage of excess weight loss at the end of 1 year was 60.19 +/- 17.45% after LSG and 82.76 +/- 34.26% after LRYGB (P= 0.021). One patient developed a sleeve leak after LSG, and 2 developed iron deficiency anemia after LRYGB. The remission/improvement in diabetes mellitus and biochemistry was similar.**Conclusion**LRYGB may offer better results than LSG in terms of weight loss in patients after 50 years of age |
| **Reason for Selection: This retrospective study can help us assess the longevity of the effects of bariatric surgery. This can help strengthen the argument of whether or not this surgery is worth the risks.** |
| **Key Points:*** Bariatric surgery has developed to be the primary treatment option for the morbidly obese who fail lifestyle interventions
* Bariatric surgery at most centers is limited to patients < 65 years of age for many reasons
* Age is an independent prognostic factor in addition to BMI, presence of diabetes mellitus and smoking in predicting postoperative mortality
* Bariatric surgery is an effective procedure for weight loss and can be safely performed even in the elderly. Although LSG has emerged as a standalone bariatric procedure with comparable results to Roux-en-Y gastric bypass—LRYGB my offer significantly better weight loss than LSG with no added morbidity
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**Article 5**

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| **Citation**: Osland, E., Yunus, R. M., Khan, S., Memon, B., & Memon, M. A. (2017). Weight loss outcomes in laparoscopic vertical sleeve gastrectomy (LVSG) versus laparoscopic Roux-en-Y gastric bypass (LRYGB) procedures: a meta-analysis and systematic review of randomized controlled trials. *Surgical laparoscopy, endoscopy & percutaneous techniques*, *27*(1), 8-18. |
| **Type of Study: Meta- Analysis and Systematic Review of Randomized Controlled Trials**  |
| **Abstract**: **Background**Laparoscopic Roux-en-Y gastric bypass and laparoscopic vertical sleeve gastrectomy have been proposed as cost-effective strategies to manage morbid obesity. The aim of this meta-analysis was to compare the postoperative weight loss outcomes reported in randomized control trials (RCTs) for LVSG versus LRYGB procedures**Method** RCTs comparing the weight loss outcomes following LVSG and LRYGB in adult population between Jan 2000 and November 2015 were selected from PubMed, Medline, Embase, Science Citation Index, Current Contents, and the Cochrane database. The review was prepared in accordance with Preferred Reporting of Systematic Reviews and Meta-Analyses (PRISMA)**Results**Nine unique RCTs described over 10 publications involving a total of 865 patients were analyzed. Postoperative follow-up ranged from 3 months to 5 years. Twelve-month excess weight loss (EWL) for LVSG ranged from 69.7% to 83% and for LRYGB, ranged from 60.5% to 86.4%. A number of studies reported slow weight gain between the second and third years of postoperative follow-up ranging from 1.4% to 4.2% EWL. This trend was seen to continue to 5 years postoperatively for both procedures. **Conclusion**In conclusion, LRYGB and LVSG are comparable with regards to the weight loss outcomes in the short term, with LRYGB achieving slightly greater weight loss. Slow weight recidivism is observed after the first postoperative year following both procedures. Long-term reporting of outcomes obtained from well-designed studies using intention-to-treat analyses are identified as a major gap in the literature at present |
| **Reason for Selection: This is a study has high level of evidence considering that it is a meta-analysis and systematic review of randomized controlled trials. This study also directly answers my research question, and is also fairly recent, being published in 2017.** |
| **Key Points:*** The result of this systematic review of RCTs suggest that Gastric sleeve and Roux-en-Y gastric bypass achieve comparable weight loss within the FIRST postoperative year and stabilizes before transforming into. Slow trend toward slow weight recidivism.
* The etiology driving weight recidivism for both procedures is considered to be multifactorial. Anatomic changes such as enlargement of the gastric pouch/gastrojejunostomy diameter may occur, in both procedures that reduces the restriction
* The review suggests that LRYGB may provide a comparatively greater degree of weight loss than LVSG in the long term
* Informed decision making based on true-cost benefits analysis for both of these procedures is required to streamline the best long-term weight
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**Article 6**

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| **Citation**: Peterli, R., Wölnerhanssen, B. K., Peters, T., Vetter, D., Kröll, D., Borbély, Y., ... & Bueter, M. (2018). Effect of laparoscopic sleeve gastrectomy vs laparoscopic Roux-en-Y gastric bypass on weight loss in patients with morbid obesity: the SM-BOSS randomized clinical trial. *Jama*, *319*(3), 255-265. |
| **Type of Study: Randomized Clinical Trials** |
| **Abstract**: **Background**Sleeve gastrectomy is increasingly used in the treatment of morbid obesity, but its long-trm outcome vs the standard Roux-en-Y gastric bypass procedure is unknown. The objective is to determine whether there are differences between sleeve gastrectomy and Roux-en-Y gastric bypass in terms of weight loss, changes in comorbidities, increase in quality of life, and adverse events.**Method** The Swiss Multicenter Bypass or Sleeve Study (SM-BOSS), a 2-group randomized trial, was conducted from Jan 2007 until November 2011 (last follow up in March 2017). Of 3971 morbidly obese patients evaluated for bariatric surgery at 4 Swiss bariatric centers, 217 patients were enrolled and randomly assigned to sleeve gastrectomy or Roux-en-Y gastric bypass. **Results**The primary end point was weight loss, expressed as percentage excess body mass index (BMI) loss. Exploratory end points were changes in comorbidities and adverse events. Among the 217 patients, 205 completed the trial. Excess BMI loss was not significantly different at 5 years: for sleeve gastrectomy, 61.1% vs Roux-en-Y gastric bypass, 69.3%. Gastric reflux remission was observed more frequently after Roux-en-Y gastric bypass (60.4%) than after sleeve gastrectomy (25.0%). Gastric reflux worsened (more symptoms or increase in therapy) more often after sleeve gastrectomy (31.8%) than after Roux-en-Y gastric bypass (6.3%). The number of patients with reoperations or interventions was 16/101 (15.8%) after sleeve gastrectomy and 23/104 (22.1%) after Roux-en-Y gastric bypass**Conclusion**Among patients with morbid obesity, there was no significant difference in excess BMI loss between laparoscopic sleeve gastrectomy and laparoscopic Roux-en-Y gastric bypass at 5 years of follow-up after surgery |
| **Reason for Selection: Firstly, this is a randomized clinical trial, meaning that it has a high level of evidence** |
| **Key Points:*** Overall, both treatments significantly reduced percentage excess BMI loss over the observation period, with significant overall differences between the groups without adjustment for multiple comparisons,
* Significant amelioration was seen after 5 years for total and high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglycerides in both groups
* The trial did not detect a statically significant difference in weight loss when measured as percentage excess BMI loss, which is in contrast to 2 recent meta-analyses comparing the two interventions, both of which found greater weight loss with Roux-en-Y gastric bypass.
* Bariatric surgery is associated with a higher risk of reinterventions than other types of surgeries
* Quality of life improved significantly after both procedures at each timepoint compared to baseline, with no significant difference between the two groups, which contrasts with current literature
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**Summary of Evidence**

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| Author (Date) | Level of Evidence | Sample/Setting(# of subjects/ studies, cohort definition etc) | Outcome(s) studied | Key Findings | Limitations and Biases |
| S. Yousef Guraya, T. Strate (2019) | Systematic review and meta-analysis | This systematic review and meta-analysis was conducted in line with PRISMA and AMSTAR Guidelines in January 2019 to explore using Medical Subject Headings morbid obesity; excess weight loss; bariatric surgery; weight loss surgery; BMI. The databases searched included PubMed-medicine, Wiley online library, Cochrane library, Taylor and Francis online, CINAHL, springer link, ProQuest, ISI web of knowledge, science direct EJS, EBSCO, Blackwell, Emerald and ABI InformCharacteristics of data extracted from selected studies included: author/s, publication year, country of study, retrospective or prospective, sample size and follow up; as well as patient’s average age, and preoperative BMI, gender and post-operative outcomes in terms of % TWL loss were recorded for further analysis19 relevant studies met the inclusion criteria | The studies compare average BMI of patients in LSG and LRYGB groups at the time of surgery, which shows similar average BMI in both groups | Overall, a %EWL of 70.4% by LRYGB and %EWL of 59.8% following LSG in at least half of the patients from the selected cohort is reported. The Conchre Q test was significant at 5%, thus rejecting the null hypothesis that all studies were identical. The findings showed that LRYGB was associated with more significant %EWL than reported by LSG. This systematic review and meta-analysis of 4742 patients reports a significantly better % TWL outcome by LRYGB at 5 year follow up with a pooled mean difference of 1.87.  | Limitations: due to a lack of sufficient number of randomized controlled trials for comparison of LRYGB and LSG for %TWL, this systematic review and meta-analysis showed heterogeneity of results. At the same time, variations in surgical technicalities of the two procedures might have some implications on this research findingBias: In this research, publication bis was determined by examination of the funnel plot obtained from all selected studies.  |
| S. Shenoy, A. Gilliam, A. Mehanna, V. Kanakala, G. Bussa, T. Gill, K. Sanderson, Y. Viswanath, V. Shanmugam (2020) | Systematic Review and meta-analysis | Inclusion Criteria:The study included all elderly patients who underwent bariatric surgery. All patients would be at least > 55 years. This was done to include all relevant studies. The patients would also have undergone either laparoscopic sleeve gastrectomy or laparoscopic Roux-en-Y gastric bypass as the primary procedure for weight loss. The study must have reported data on BMI, early and late procedure-related complications, resolution of comorbidity, and survival. The study would have a minimum follow-up period of 1 year and be published in the English language in a peer-reviewed journal. | The primary aim of the study was to compare the safety and efficacy of the two bariatric procedures. The safety outcome was determined by the procedure-related morbidity and 90-day mortality associated with the interventionThe primary outcome of the efficacy was determined by the weight loss attained by the patients undergoing the procedure. The assessment for weight loss has been determined as excess weight loss (%EWL) given that it was the most commonly used parameter in bariatric surgery outcomes. The secondary outcomes to evaluate the efficacy of the procedure included resolution of obesity-related comorbidities including diabetes mellitus, hypertension and OSA. | The results of the study showed that there was no statistically significant difference between the two procedures for early major peri-operative complications.Study revealed that patients who underwent LSG were significantly less likely to develop late complicationsGiven that LSG is a less demanding procedure, it is recommended for patients who have associated inflammatory bowel disease or patients who need a staged concept or expected to have major adhesions undergo LSG | An analysis was conducted to rule out any publication biasThe study had a few limitations. The studies included in the analysis were mostly observational, deceasing the internal validity of the study. Moreover, the total number of studies found to be suitable for this meta-analysis is low, another limitation of note. A well-designed randomized controlled trial comparing the two procedures would be necessary to increase the evidence for identifying the safer and more beneficial procedure in the short and long term. Secondly, the follow-up data was limited to 1 year |
| J. Li, D. Lai, D. Wu (2016) | Systematic Review and Meta-Analysis | Inclusion criteria:1. Randomized controlled trials, controlled clinical trials, and cohort studies or retrospective observational studies regardless of publication date
2. Surgical treatment with LRYGB or LSG
3. Adult populations only (>18 years of age) and BMI >35 kg/m^2

Exclusion criteria:1. Non-human studies
2. Non-surgical interventions
3. Letters and comments
4. Unreliable design or obvious statistical errors as evaluated by two independent investigators

The sample size ranged from 12 to 5898 patients | The outcomes studied in this systematic review and meta-analysis included:1. Diabetes resolution
2. Percent excess weight loss (%EWL)
3. Resolution of obesity-related comorbidities
 | Results showed that LRYGB resulted in greater weight loss than LSG and that LRYGB had better efficacy for resolving hypertension, dyslipidemia, GERD, and arthritis. Both techniques were similarly effective for resolving T2DM and sleep apneaMeta analysis suggested that LRYGB resulted in a greater %EWL than LSG, which may be explained by the fact that this procedure restricts not only the patient’s eating ability but also decreases the resorption of nutrients from the small bowel, as well as gut hormones in mediating weight loss changeThe long-term benefits to metabolic function are related to the surgery-induced weight loss and subsequent decreased adiposity and lipotoxicity | Study had several limitations. First, the different operation methods were performed by different surgeons n different countries; thus, difference between the two procedures. Second, because of ethical limitations, not all of the trials were randomized controlled trials, and the sample size in some studies was rather small. Third, as funnel-plot analysis was used to investigate publication bias for only T2DM, hypertension, and dyslipidemia; a selection bias may have been introduced |
| P. Praveenraj, R. Gomes, S. Kumar, S. Perumal, P. Senthilnathan, R. Parthasarathi, S. Rajapandian, C. Palanivelu (2016) | Retrospective Analysis | All obese elderly patients over the age of 50 who underwent LSG or LYRGB between Feb 2012 and July 2013 and with at least 1 year of follow up were included in the study | The goal was to compare the degree of weight loss between laparoscopic sleeve gastrectomy (LSG) and laparoscopic Roux-en-Y gastric bypass (LRYGB) in patients above the age of 50 years at 1 year after surgery | The mean percentage of excess weight loss at the end of 1 year was 60.19 +/- 17.45% for Group I versus 82.76 +/- 34.26% for Group II. A total of 28 patients had T2DM in Group I with 26 patients resolved at 1 year. 25 patients in Group II had T2DM, with 23 patients resolved at 1 year.  | The major limitations of this study are that it was a retrospective study with a small number and a short follow up of only 1 yearLarger studies with longer follow-up are needed to evaluate the impact of different bariatric procedures in elderly obese patients |
| E. Osland, R. Yunus, S. Khan, B. Memon, M. Memon (2017) | A meta-analysis and systematic review of randomized controlled trials | RCTs comparing clinical outcomes of elective LVSG and LRYGB procedures in adult subjects (above 16 y) that reported weight loss outcomes were reviewed. Qualitative review was performed on all studies that met inclusion criteria, and meta-analyses were run on outcome variables where numbers and methods of reporting were sufficient to allow statistical analysis | The aim of this systematic review and meta-analysis is to study the peer-review literature regarding postoperative weight loss outcomes reported from randomized control trials comparing LVSG and LRYGB bariatric procedures | The results of this systematic review of RCTs reporting weight loss outcomes of up to 5 years postop suggest that LRYGB and LVSG achieve comparable weight loss within the first postop year, and thereafter stabilize before transforming into slow trend toward slow weight recidivismLRYGB may provide a greater degree of weight loss moving from 2-5 years postop compared with LVSGIn the case of %EWL at 12 months, meta-analysis favored LRYGB for superior weight loss outcomes compared with LVSGThe etiology driving weight recidivism for both procedures is multifactorial; anatomic changes such as an enlargement of the gastric pouch/ gastrojejunostomy diameter may occur, in both procedures that reduce the restrictionRoux-en-Y gastric bypass has been associated with changes to gastric hormones such as increased peptide YY. Similarly ghrelin levels which stimulate appetite and have been shown to decrease initially post-RYGB, are observed to slowly increase in the follow-up period and may also contribute to weight regain as appetite suppression declines.The review, along with much of the literature in this area, suggest LRYGB may provide a comparatively greater degree of weight loss than LVSG in the long term | The included studies covered a diverse range of ethnicities and comorbid conditions- it is possible that with different metabolic responses in some studies with a high proportion of diabetic patients, or with different relative degrees of obesity in different ethnic groups, that this may impact the conclusions drawn. Second- the slightly different surgical techniques described in the methodologies sections of the included studies; this highlights the variation in surgical practice for otherwise standard procedural terminology. This has obvious impacts for the interpretation of weight loss between studies outcomes.Third is the short duration of follow up reported by most studies. Of the 9 studies that met criteria, only 3 reported outcomes beyond 12 months postopFourth is the potential impact of the moderate methodological quality of the included studies |
| R. Peterli, B. Wolnerhanssen, T. Peters, D. Vetter, D. Kroll, Y. Borbely, B. Schultes, C. Beglinger, J. Drewe, M. Schiesser,, P. Nett, M. Bueter (2018) | Randomized Clinical Trial | Inclusion criteria: a BMI greater than 40 or a BMI greater than 25 with the presence of at least 1 comorbidity, an age of 18-65 years, and failure of conservative treatment for 2 yearsExclusion criteria: contraindications for major abdominal surgery, previous bariatric surgery, severe symptomatic gastroesophageal reflux disease despite medication, large hiatal hernia, expected dense adhesion at the level of the small bowel, need for endoscopic follow-up of the duodenum, and history of IBD | The primary end point was weight loss, expressed as percentage excess BMI loss. Exploratory end points were changes in comorbidities and adverse events | Overall, both treatments significantly reduced percentage excess BMI loss over the observation period, with significant overall differences between the groups without adjustment for multiple comparisons. There was a significant trend for a linear decrease in excess BMI loss over the follow-up period for both treatment groupsAt 5 years after surgery, complete remission of diabetes was seen in 16 or 26 in the sleeve gastrectomy group vs 19 of 28 in the Roux-en-Y gastric bypass group. Quality of life increased significantly in both groups between baseline and 5 years | The study has several limitations. First, the study is underpowered for the exploratory end point of type 2 diabetes remission. Although no significant differences were found between the 2 procedures regarding their antidiabetic effects, this trial does not allow for firm conclusions on the absence of differencesSecond, because randomized trials are conducted under idealized and rigorously controlled conditions, their generalizability might be compromised.The protocol didn’t include an upper limit for BMI and there were a few patients with a BMI above 60 in both groups |

**Conclusions:**

Overall, the articles that I found that long term, a laparoscopic Roux-en-Y Gastric Bypass has a higher percentage of excess weight loss and better resolution of hypertension, dyslipidemia, GERD, and arthritis compared to a gastric sleeve. Additionally, there was no difference between gastric sleeve and Roux-en-Y gastric bypass regarding early complications and mortality.

1. *Guraya et al:* This study shows %TWL of 70.4% by LRYGB and 59.8% following LSG in at least half of patients from selected cohort. A significantly greater % TWL by LRYGB in short and long term, while higher % TWL by LSG in mid-term is reported. This systematic review and meta-analysis of 4742 patients reports a significantly better % TWL outcome by LRYGB at 5 year follow up with a pooled mean difference of 1.87.
2. *Shenoy et al:* There was no difference between LSG and LRYGB regarding early complications and mortality 3.6% versus 5.8% and 0.1% versus 0.8%. Patients who underwent LRYGB had more late complications compared with those who underwent LSG. There was no difference in terms of weight loss at the end of 1 year. Patients who underwent LRYGB had a better resolution of obesity-related comorbidities, not statistically significant
3. *Li et al:* Patients receiving LRYGB had a significantly higher percentage of excess weight loss and better resolution of hypertension, dyslipidemia, GERD, and arthritis compared with those receiving LSG. LRYGB and LSG showed similar effects on type 2 diabetes and sleep apnea.
4. *Praveenraj et al:* The mean percentages of excess weight loss at the end of 1 year was 60.19 +/- 17.45% for Group I versus 82.76 +/- 34.26% for Group II. A total of 28 patients had T2DM in Group I with 26 patients resolved at 1 year. Two patients with long-standing diabetes on insulin showed improvement at 1 year. 25 patients in Group II had T2DM, with 23 patients resolved at 1 year. Two patients with long-standing diabetes on insulin showed improvement at 1 year. There was no difference in diabetes resolution or improvement in biochemistry.
5. *Osland et al:* Twelve-month excess weight loss (EWL) for LVSG ranged from 69.7% to 83% and for LRYGB, ranged from 60.5% to 86.4%. A number of studies reported slow weight gain between the second and third years of postoperative follow-up ranging from 1.4% to 4.2% EWL. This trend was seen to continue to 5 years postoperatively for both procedures.
6. *Peterli et al:* Excess BMI loss was not significantly different at 5 years: for sleeve gastrectomy, 61.1% vs Roux-en-Y gastric bypass, 69.3%. Gastric reflux remission was observed more frequently after Roux-en-Y gastric bypass (60.4%) than after sleeve gastrectomy (25.0%). Gastric reflux worsened (more symptoms or increase in therapy) more often after sleeve gastrectomy (31.8%) than after Roux-en-Y gastric bypass (6.3%). The number of patients with reoperations or interventions was 16/101 (15.8%) after sleeve gastrectomy and 23/104 (22.1%) after Roux-en-Y gastric bypass

**Weight of Evidence:**

Overall, the majority of the articles that I chose had high level of evidence and addressed the research question directly; and so I felt they were reliable sources to extract data from. I weighed the articles based on level of evidence and how directly they answered my PICO.

1. *Guraya et al:* I rank this article first because not only is this a systematic review and meta-analysis, but it also one of the more recent articles published in 2019. This article most directly answers my research question because it focuses on weight loss outcomes in patients with morbid obesity. The results were based on the findings of 19 different studies. The meta-analysis also had a large sample size of 4742 patients and had a 5 year follow-up period which increases the reliability of this study.
2. *Shenoy et al*: Although this is the most recent Systematic Review and Meta-analysis in my PICO, I rank this study fifth because the population focuses only on patients who are >55 years old. Although I think this is an important population to focus on, it does not give an accurate representation of the effectiveness of this procedure in the overall population.
3. *Li et al:* I ranked this article fourth because it is a systematic review and meta-analysis that focused on how LRYGB and LSG affected obesity-related comorbidities. I thought that this was important because these patients who get bariatric procedures tend to have other health issues that are caused by their obesity. I felt that the results found in this study would further strengthen the argument regarding which procedure was more effective.
4. *Praveenraj et al:* I ranked this article last because it is a retrospective analysis study that also focused on elderly patients > 50 years old. Also the follow up period was only 1 year, whereas other studies had a longer follow-up period.
5. *Osland et al*: I ranked this meta- analysis and systematic review of randomized controlled trials as third. I felt that this was a strong article as well because it had a one year follow up as well as a 5 year follow up. This article also focused on anatomical factors that may have played a role in weight loss such as changes in gastric hormones.
6. *Peterli et al:* I ranked this article second because although it is a randomized controlled trial, it is still a very recent peer-reviewed article that directly addresses the research question. It has a wide inclusion criterion as well as a long follow up period of 5 years. One of the main limitations was that there was no upper limit to the BMI and not many patients had a BMI >60 which may have skewed the results.

**Clinical Bottom Line**

**Magnitude of any Effects:**

I would rate the magnitude of effects as moderate. Overall, the studies seem to agree that in the long-term, a LRYGB would be more effective than LSG for weight loss. However, there needs to be stricter criteria on the BMI that is included in the studies, as well as more studies conducted in general. One major issue with these systematic reviews was that there were not many studies that fulfilled the criteria that could be included in the review.

**Clinical Significance:**

The data I gathered came from 3 systematic reviews/ meta-analysis and 1 retrospective study- all of which have high levels of evidence. All the studies I have included were published within the last 6 years, meaning that the results of these studies are current and up-to-date. Additionally, articles 1,5, and 6 had 5-year follow-ups which was useful to assess the long-term effects of LRYGB vs LSG.

The consensus tells us that laparoscopic Roux-en-Y gastric bypass provides better weight loss results compared to laparoscopic gastric sleeve.

Article 3 mentions how LRYGB provides better resolution of obesity-related diseases such as of hypertension, dyslipidemia, GERD, and arthritis. LRYGB and LSG provided similar results in resolving OSA and T2DM. According to Article 4, although LSG has emerged as a standalone bariatric procedure with comparable results to Roux-en-Y gastric bypass—LRYGB may offer significantly better weight loss than LSG with no added morbidity. Furthermore, Article 5 proves that LRYGB shows an increase in weight loss over the first postop year compared to LVSG, so we can rest assured that the effects of LRYGB are long-lasting.

 Taking the conclusions of all these studies into account, the more effective option for the patient in this case study would be the LRYGB. Considering that the patient in this case is 61 years old with a PMH of OSA and T2DM and her primary focus was losing weight and resolving her OSA- I would highly recommend undergoing LRYGB if LSG was ineffective. Additionally, as I mentioned before, both LSG and LRYGB would have equal effects on OSA and sleep apnea- so this option would be geared more towards weight loss.

**Other Considerations:**

I would consider the risks for a morbidly obese patient to undergo surgery and include that information in the study as well. I would also assess if there is an appropriate age-range for this surgery, as well as what appropriate post-op care contributes to more effective results (i.e. diet, exercise regimens, supplements, medications).