

CLINICAL OUTCOMES AND HEALTHCARE RESOURCES UTILIZATION OF POWERED STAPLERS USED IN LAPAROSCOPIC BARIATRIC SURGERY: A COMPARATIVE-EFFECTIVENESS STUDY

Introduction

Prior studies evaluating stapler technology in bariatric surgery have primarily compared powered and manual staplers, with data extending only through 2018.

To date, no study has evaluated both sleeve gastrectomy (SG) and gastric bypass (GB) procedures using contemporary real-world evidence data.

Objective

To compare the clinical outcomes and healthcare resources utilization of two powered staplers used in the treatment of laparoscopic bariatric surgical procedures.

Methods

Data Source: PINCAI™ Healthcare data, January 2021 to June 2024

Study Population:

Adult patients (age≥ 18) undergoing primary and elective laparoscopic bariatric surgery (SG or GB)

Patients undergoing surgery with single-use (SU, Echelon™ 3000, Echelon™ Flex Power Plus) or multiple-use (MU, Signia™ Power) powered staplers.

Outcomes Measures:

Clinical Outcomes: Anastomotic leak, blood transfusion and bleeding, 30-days all cause readmission, ICU visits

Healthcare Resource Utilization: Operating room time (OR-time, in minutes), lengths of stay (LOS, in days), costs (in 2024 USD)

Patients & Providers Characteristics:

Age, gender, race & ethnicity, marital status, payer, Charlson Comorbidity Index (CCI), obesity diagnosis, concurrent treatment of hiatal hernia, geographical region, rural/urban settings, bed size, teaching status, hospital/surgeon annual bariatric procedure volume

Statistical Analyses:

Primary analysis: Baseline characteristics were balanced using optimal full-match propensity score matching.

Sensitivity analysis: 1:1 nearest-neighbor propensity score matching without replacement was performed.

Post-matching analysis: Multivariable generalized linear models were applied with binomial distribution with log-link for categorical outcomes and gamma distribution with log-link for continuous outcomes; outcomes consistent across primary and sensitivity analyses were considered robust.

Statistical software: Analyses were conducted using SAS 9.4 and R 4.4.2; propensity score matching was performed using the MatchIt and Optmatch R-packages; p-value < 0.05 was considered statistically significant.

Methods

Figure 1: Cohort selection

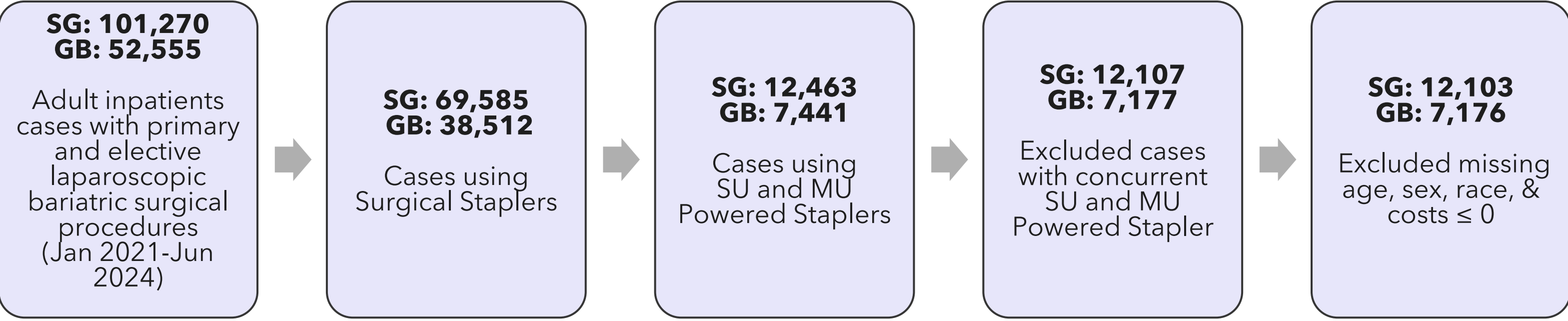
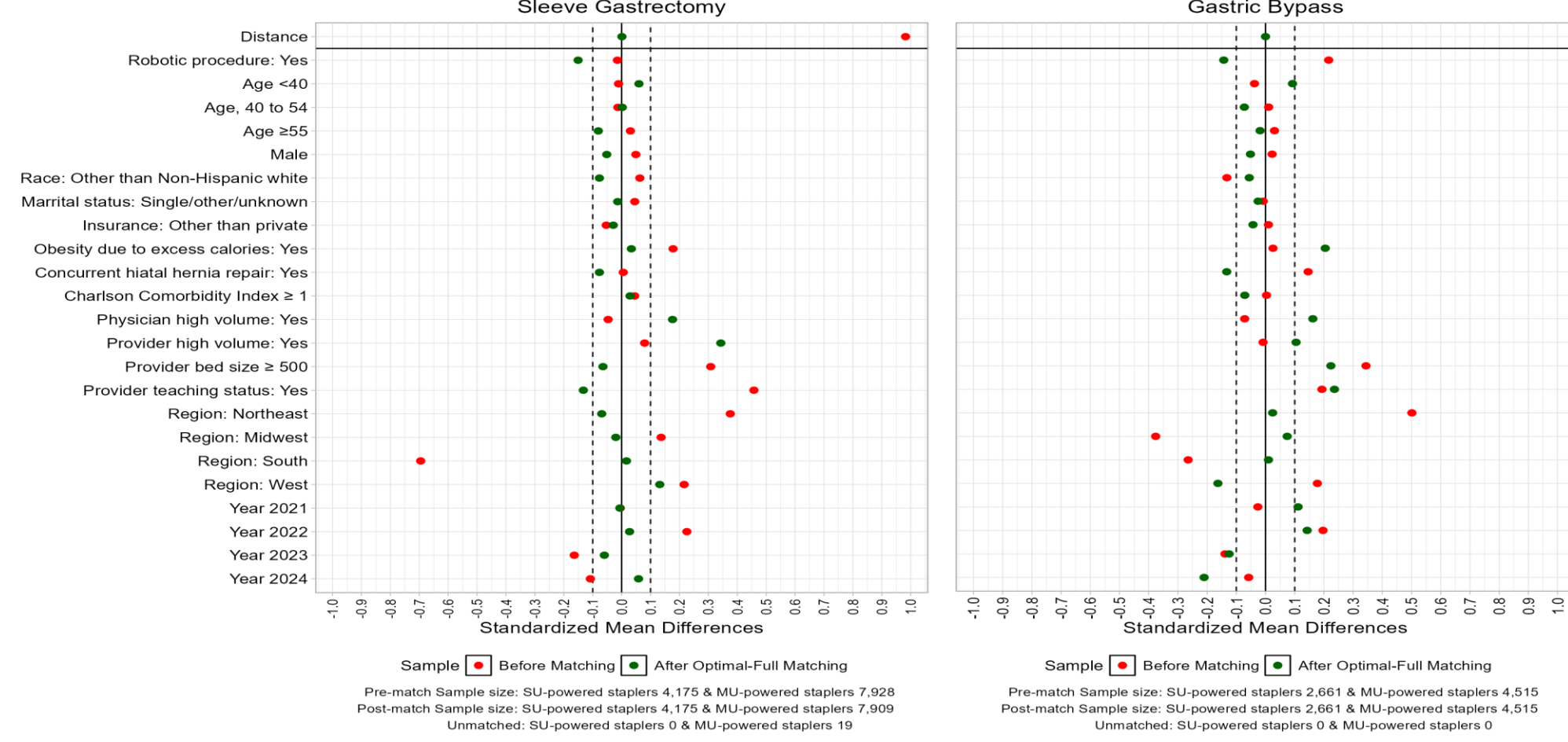


Figure 2: Covariates balance using Optimal-full match (Primary analysis)



Results

Baseline Descriptions: A total of 12,103 SG (65.5% MU, 34.5% SU) and 7,176 GB (62.92% MU, 37.08% SU) cases were included.

Clinical Outcomes:

- No statistical differences in anastomotic leaks, bleeding, or ICU visits were observed between the MU and SU powered stapler groups for both procedures. (Table 1)
- MU and SU staplers showed inconsistent 30-day readmission rates for SG and GB, along with inconsistent blood transfusion rates for GB, between primary & sensitivity analyses.

Healthcare Resources Utilization:

- MU-powered staplers significantly reduced OR time by 7.04 minutes for SG and 31.18 minutes for GB ($p < 0.001$, both), with consistent findings in sensitivity analyses (Fig 3 & 4).
- MU-powered staplers increased length of stay (LOS) by 0.10 days for SG. (Table 2)

Table 1: Clinical Outcomes (Primary analysis)

	Sleeve Gastrectomy		Gastric Bypass	
	SU powered staplers (ref.)	Odds Ratio	p-value	Odds Ratio
Anastomosis Leak		0.45	0.247	1.13
Bleeding		1.37	0.189	0.75
Blood Transfusion		1.15	0.663	-
ICU visit		0.69	0.205	0.64

a. The difference in blood transfusion rate was inconsistent between primary & sensitivity analyses for GB

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Results

Figure 3: Gastric Sleeves OR-time in minutes

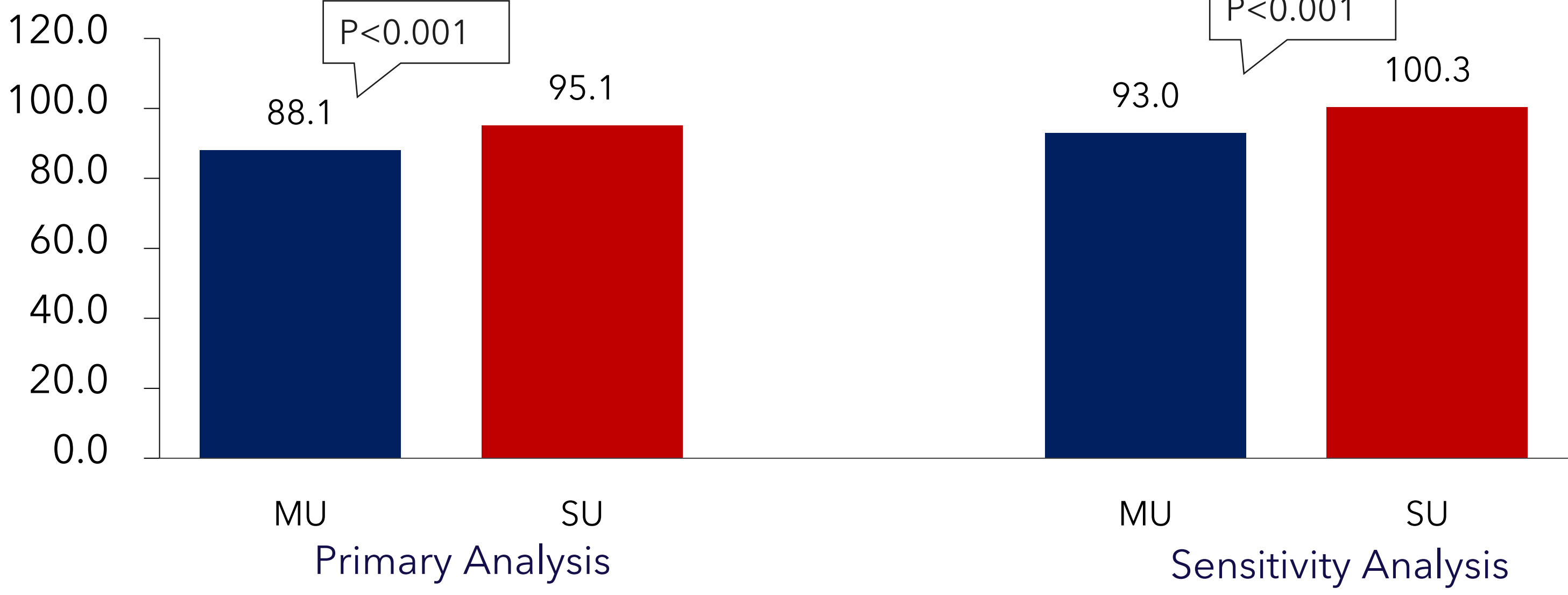


Figure 4: Gastric Bypass OR-time in minutes

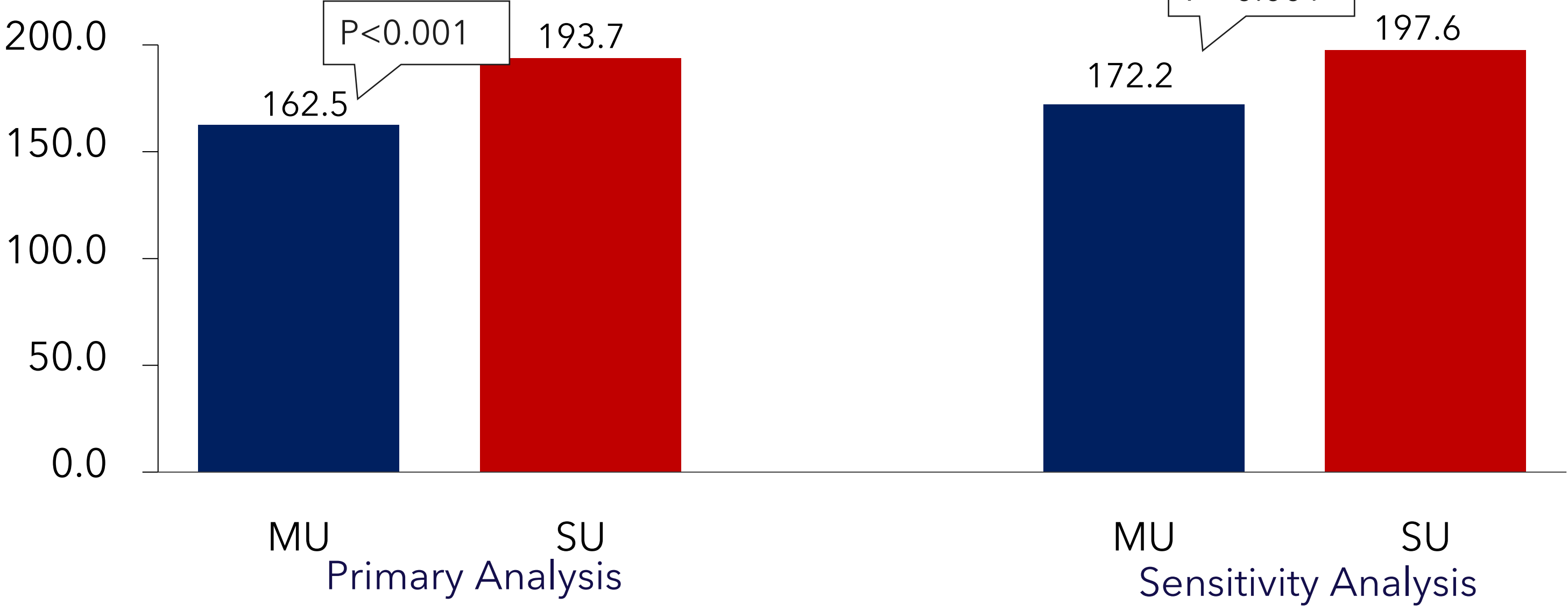


Table 2: Resources Utilization (Primary analysis)

	Sleeve Gastrectomy		Gastric Bypass	
	Mean difference (MU-SU)	p-value	Mean difference (MU-SU)	p-value
OR-time (Minutes)	-7.04	<0.001	-31.18	<0.001
LOS (Days)	0.1	<0.001	-	a
Total Costs	\$209	0.055	-	a

a. The difference in LOS and total costs showed inconsistent results between primary and sensitivity analyses for GB

Conclusion

MU and SU powered staplers showed comparable clinical outcomes and resource utilization for both SG and GB, with MU demonstrating greater efficiency through reduced OR-time.

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