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APPROCCIO ROBOTICO NEGLI INTERVENTI PRIMARI O DI REVISIONE

Angelo Iossa MD PhD

Ricercatore Sapienza University of Rome

Responsabile Centro di Eccellenza SICOB

Polo Pontino Sapienza-Latina

ICOT Hospital



Company

Global Surgical Robots Market Size, 2020 to 2030 (USD Billion)

20,98

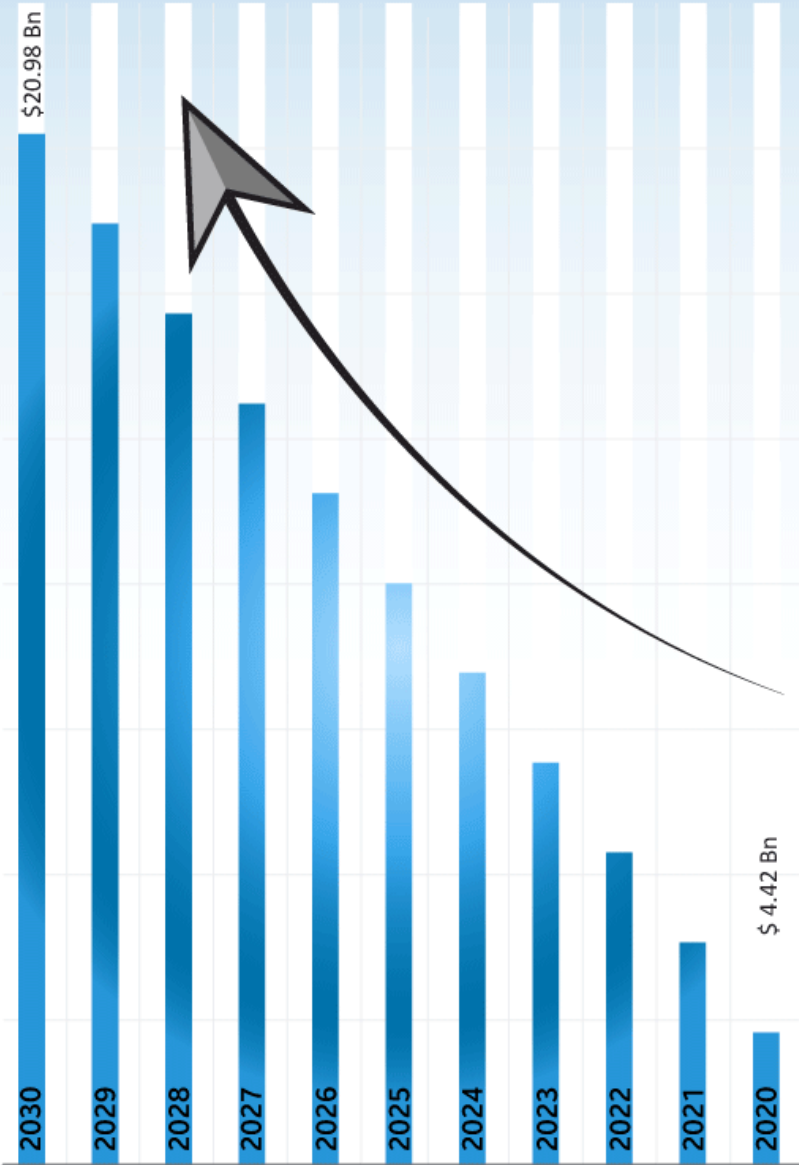
STRATEGIC
MARKET RESEARCH

Medtronic

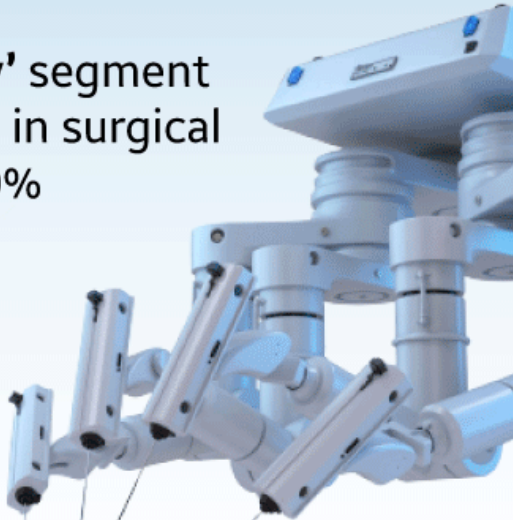
Cambridge Medical
Robotics

Intuitive Surgical

Medrobotics Corp.



The '**General Surgery**' segment had the largest share in surgical robots with around 29% in 2021.



North America

North America dominated surgical robots market.



Marketing Information
(n. Procedures/Platform)

>10,000 procedures performed
(February 2023)
>49 installed platforms
between 2016 and 2022 [117]

NR

Reddot award winner 2022

Marketing Information

840 procedures
(December 2022)
28 installed platforms
(September 2022) [118]

Fist clinical procedure in May
2022 [119]

4 installed platforms [120]
iF design award 2020

30 procedures performed [121]

NR

NR

5 installed platforms
100 procedures
performed [122]

First clinical trial
ongoing [123]



Evolution



or

~~Revolution?~~

3UONJfJnOΛE6H



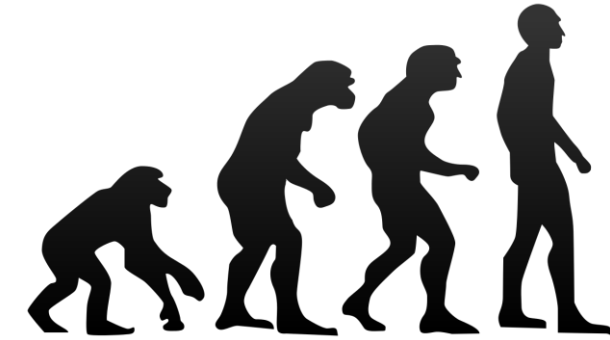
Elon Musk   @elonmusk · 5h

Robots will surpass good human surgeons within a few years and the best human surgeons within ~5 years.

@Neuralink had to use a robot for the brain-computer electrode insertion, as it was impossible for a human to achieve the required speed and precision.

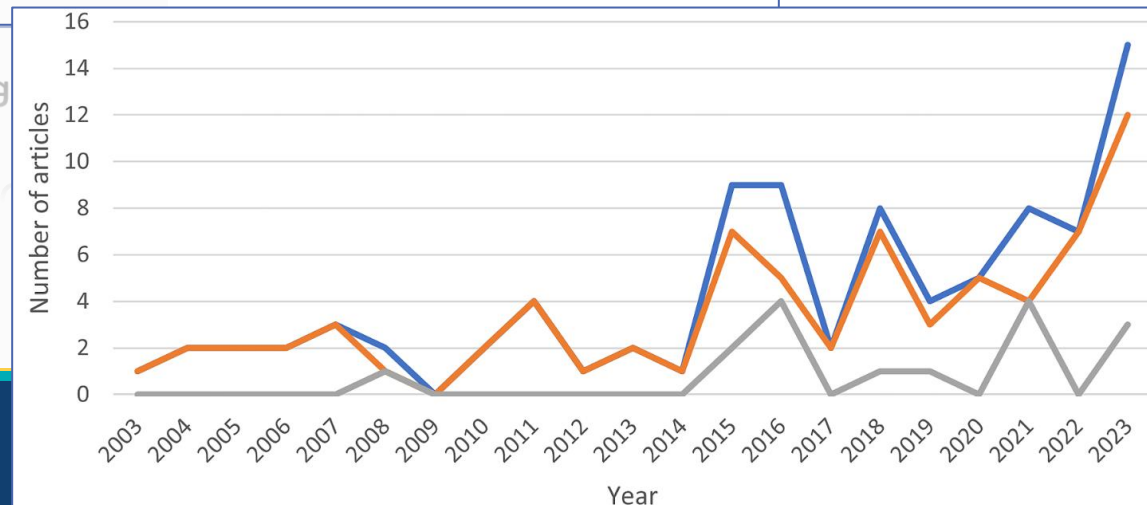


Evolution and Adoption



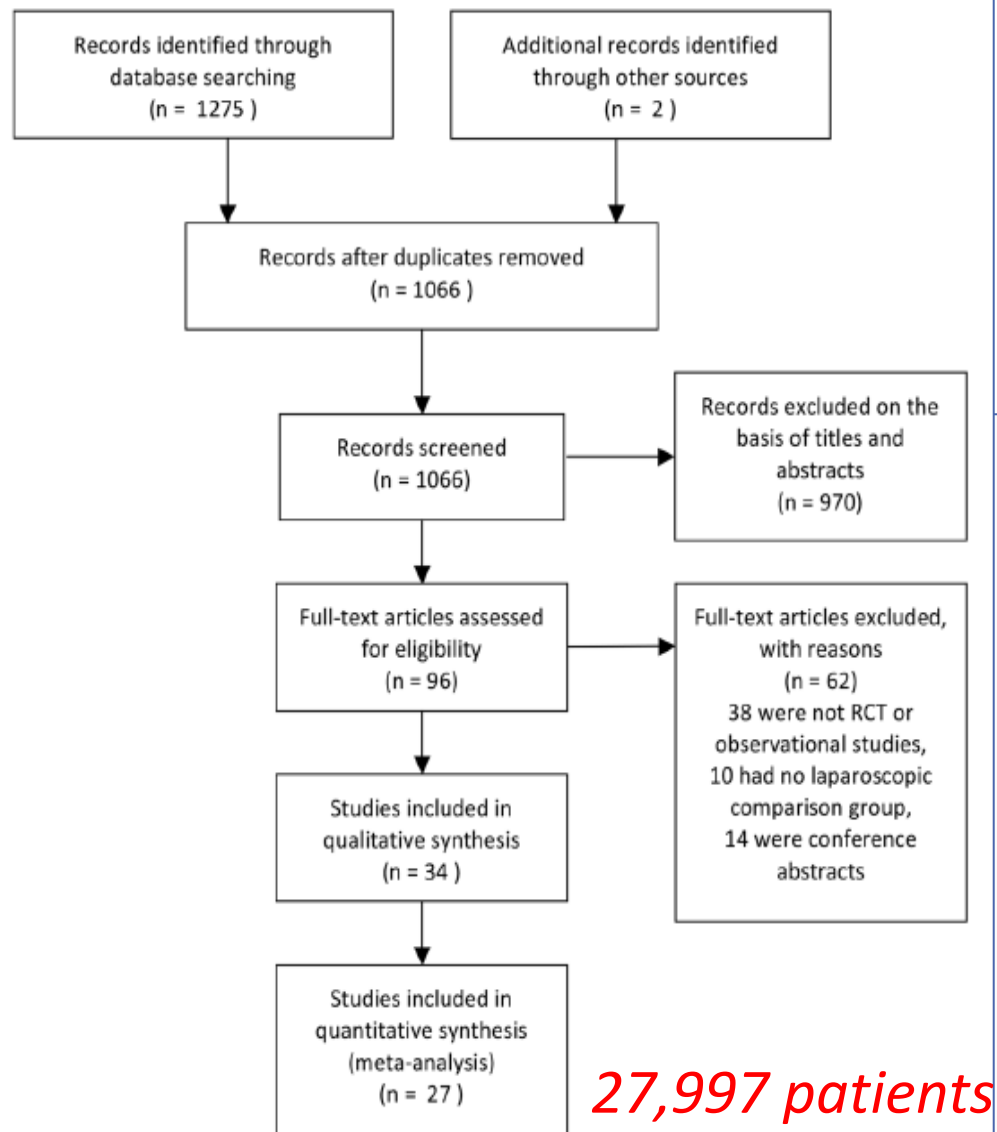
- Transition from open to laparoscopic and now robotic approaches.
- Robotic surgery offers 3D vision, articulated instruments, enhanced precision.
- Increasing adoption in complex and revisional cases.

- US adoption (2015–2022): Revisional SG (6.1% to 24.2%), Revisional RYGB (7.3% to 32.0%)
 - Primary RYGB: 6.8% to 16.7%, Primary SG: 6.0% to 17.2%
- Europe: Lower adoption, e.g., Italy (0.6%), France and Sweden (0%)





PRIMARY BARIATRIC PROCEDURES



2016

Robotic Versus Laparoscopic Bariatric Surgery: a Systematic Review and Meta-Analysis

Kun Li¹ • Jianan Zou² • Jianxiong Tang¹ • Jianzhong Di³ • Xiaodong Han³ • Pin Zhang³

Primary Outcomes

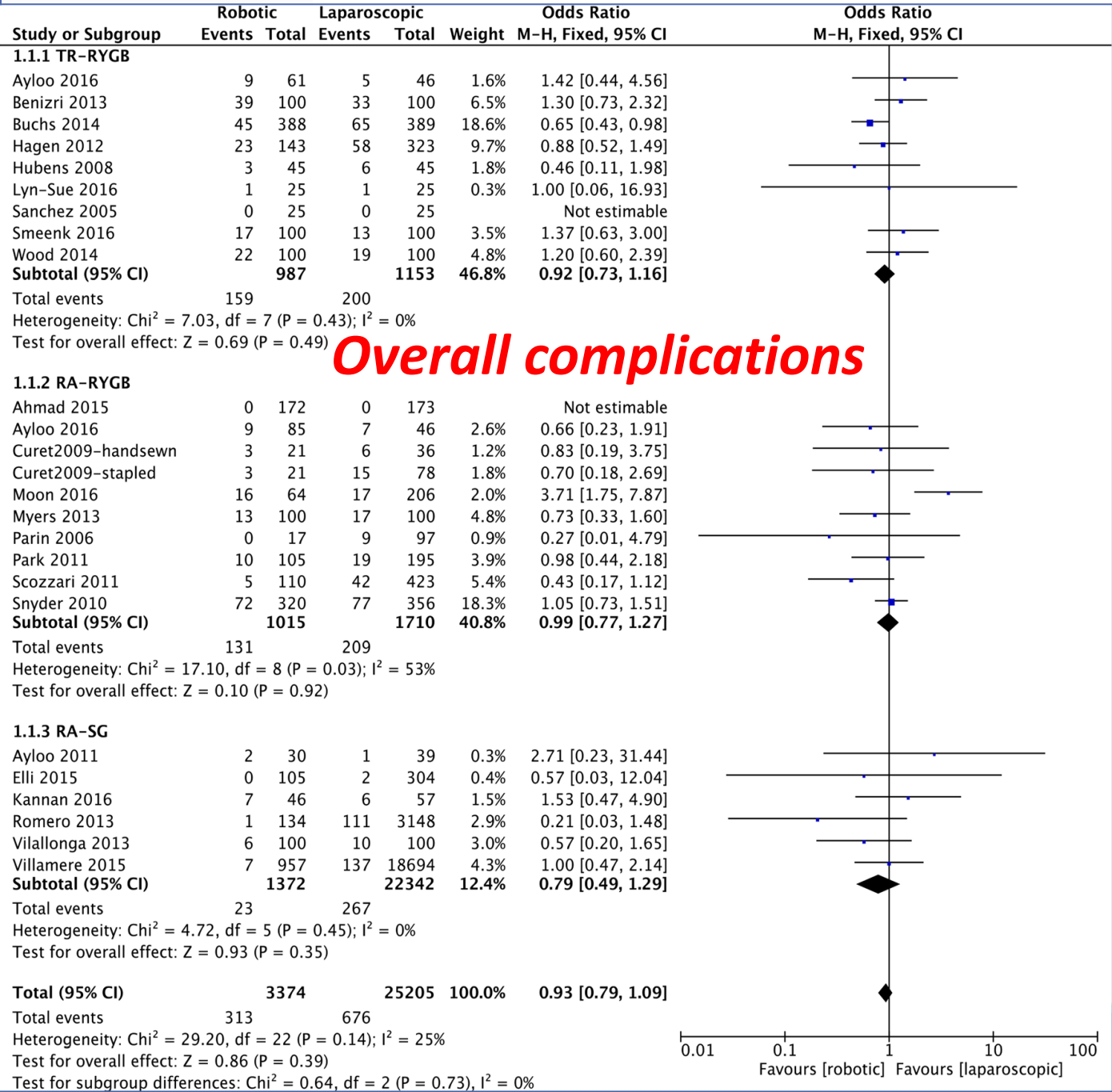
Overall complications,
Major complications (Grade 3 and 4 complications)
Minor complications (Grade 1 and 2 complications)
Anastomotic leak,
Stricture or stenosis,
Gastrointestinal (GI) or abdominal bleeding,
Reoperation,
Mortality,
Operative time, and
Length of stay (LOS).



Robotic Versus Laparoscopic Bariatric Surgery: a Systematic Review and Meta-Analysis

Kun Li¹ • Jianan Zou² • Jianxiong Tang¹ • Jianzhong Di³ • Xiaodong Han³ • Pin Zhang³

The meta-analysis revealed that there was an increased operative time after RBS, RARYGB, and RASG compared with laparoscopic procedures (SMD 0.61, 95 % CI 0.25–0.96, $P < 0.0001$; SMD 1.13, 95 % CI 0.31–1.95, $P = 0.007$; SMD 0.56, 95 % CI 0.29–0.83, $P < 0.0001$)

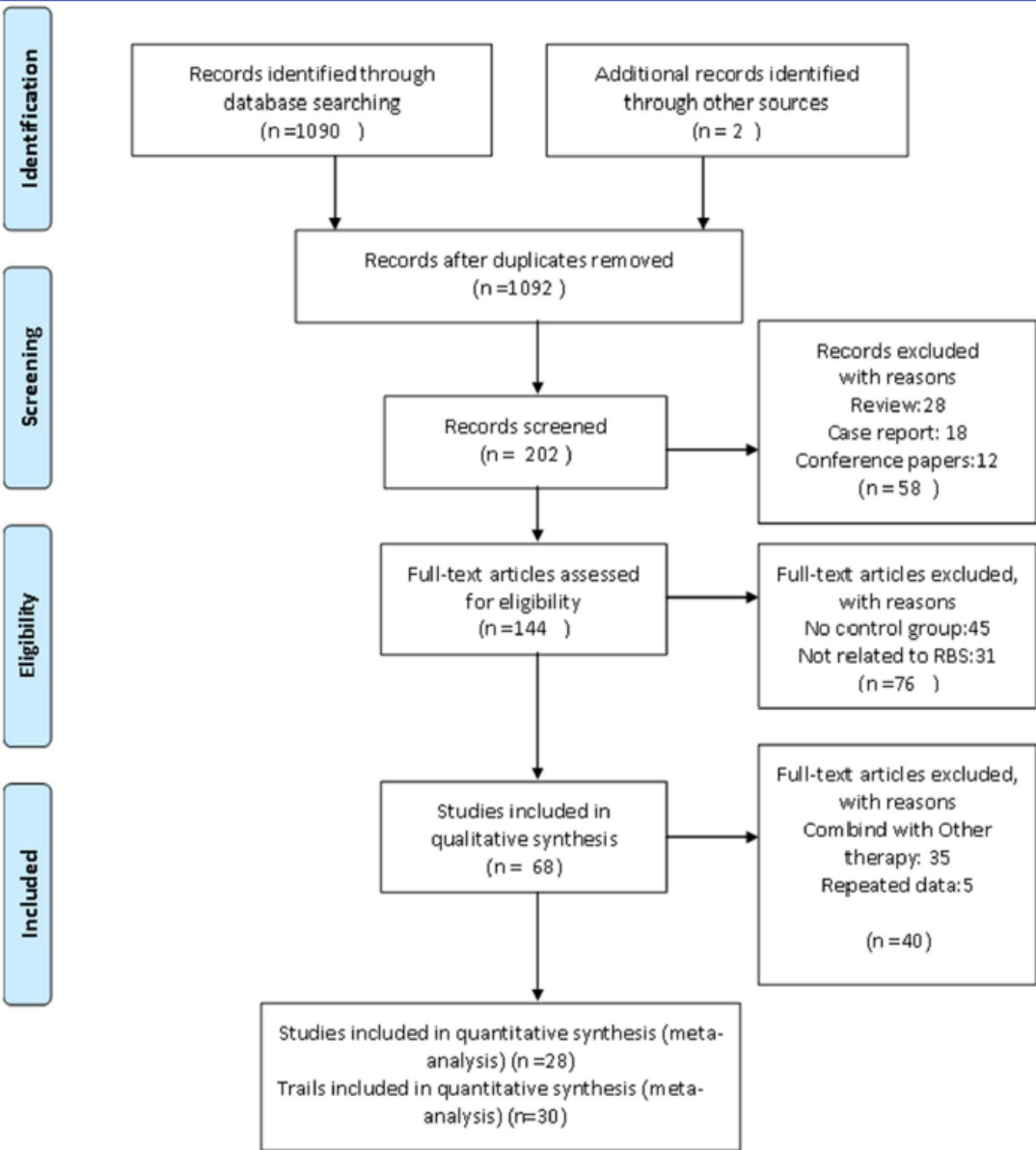




Robotic bariatric surgery for the obesity: a systematic review and meta-analysis

Zhengchao Zhang^{1,2} · Lele Miao^{1,2} · Zhijian Ren^{1,2} · Yumin Li^{1,2}

7,239 robotic vs 203,181 laparoscopic





REVIEW ARTICLE



Robotic bariatric surgery for the obesity: a systematic review and meta-analysis

Zhengchao Zhang^{1,2} · Lele Miao^{1,2} · Zhijian Ren^{1,2} · Yumin Li^{1,2}

Table 3 Results in RBS and LBS

Categorical outcomes	Number of studies (size)	Effect estimate	95%CI	<i>I</i> ²	<i>P</i>
Operative time	15 (141,009)	WMD = 27.61	16.27–38.96	<i>I</i> ² = 96.4%	<i>P</i> < 0.01
Length of hospital stay	21 (189,685)	WMD = − 0.02	− 0.19–0.15	<i>I</i> ² = 83.2%	<i>P</i> = 0.819
Reoperation within 30 days	9 (140,303)	OR = 1.36	0.65–2.82	<i>I</i> ² = 64.8%	<i>P</i> = 0.411
Overall complications	16 (163,587)	OR = 0.88	0.68–1.15	<i>I</i> ² = 29.0%	<i>P</i> = 0.362
Leak	19 (142,592)	OR = 0.84	0.37–1.95	<i>I</i> ² = 66.4%	<i>P</i> = 0.691
Stricture	11 (140,430)	OR = 1.05	0.52–2.12	<i>I</i> ² = 55.2%	<i>P</i> = 0.895
Pulmonary embolisms	4 (1858)	OR = 1.97	0.93–4.17	<i>I</i> ² = 0%	<i>P</i> = 0.075
Estimated blood loss	4 (960)	WMD = -1.93	− 4.61–0.75	<i>I</i> ² = 0%	<i>P</i> = 0.158





REVISIONAL BARIATRIC PROCEDURES

REVIEW

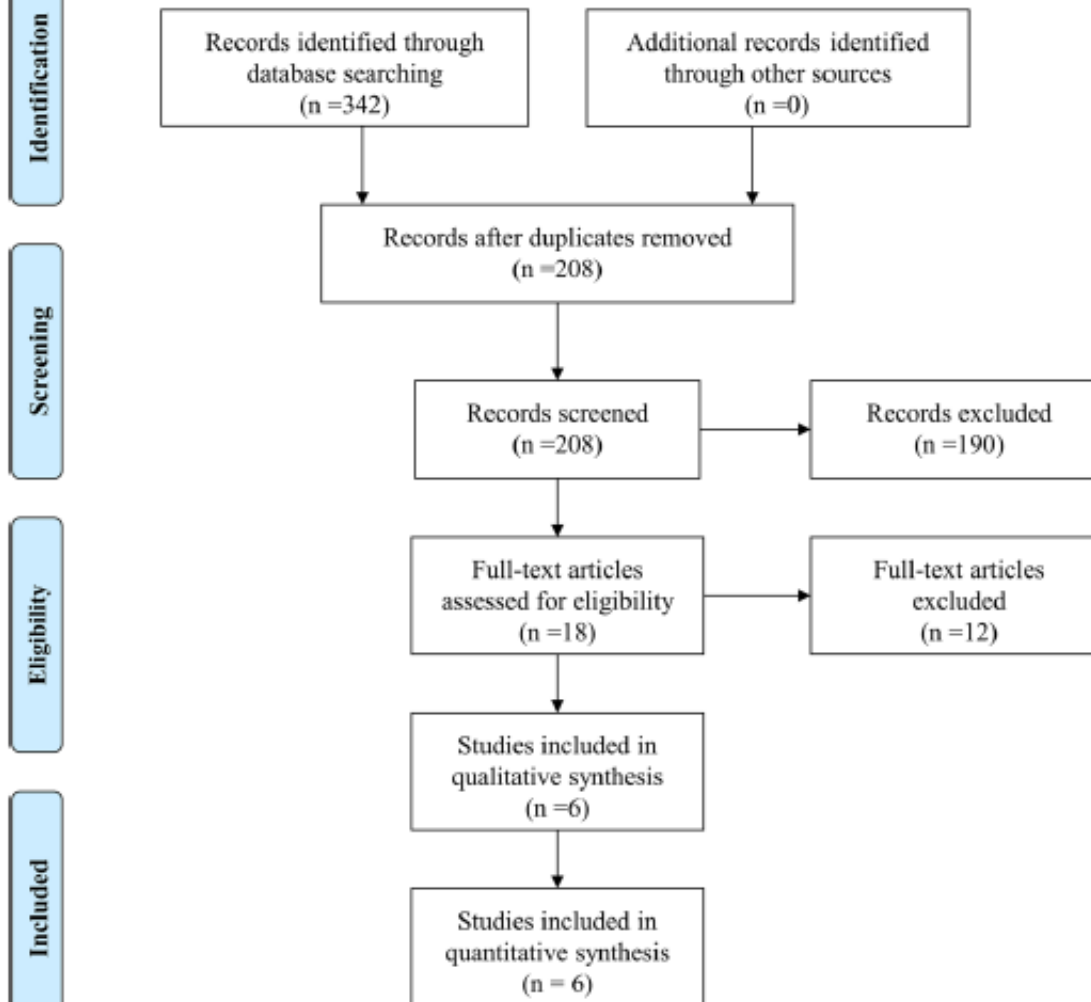


Robotic-Assisted Versus Laparoscopic Revisional Bariatric Surgery: a Systematic Review and Meta-analysis on Perioperative Outcomes

Maria Vittoria Bertoni¹ · Michele Marengo² · Fabio Garofalo¹ · Francesco Volontè^{1,3} · Davide La Regina² · Markus Gass^{4,5} · Francesco Mongelli¹ 


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29,890 pts
2459 robotic and 27,431 laparoscopy



REVIEW

Robotic-Assisted Versus Laparoscopic Revisional Bariatric Surgery: a Systematic Review and Meta-analysis on Perioperative Outcomes

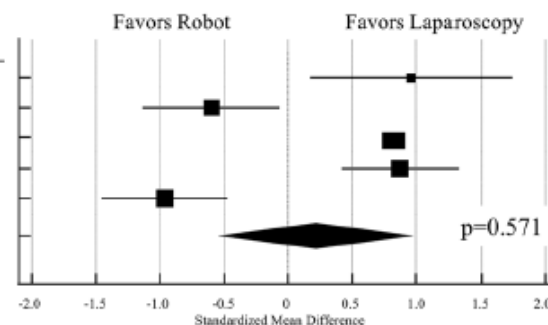
Maria Vittoria Bertoni¹ · Michele Marengo² · Fabio Garofalo¹ · Francesco Volontè^{1,3} · Davide La Regina² · Markus Gass^{4,5} · Francesco Mongelli¹ 

Received: 6 June 2021 / Revised: 11 August 2021 / Accepted: 11 August 2021 / Published online: 19 August 2021
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Operative time

	Patients	SMD	95% CI
Buchs NC 2014 ²⁰	32	0.961	0.181 – 1.742
Gray KD 2018 ²¹	84	-0.599	-1.131 – -0.066
Nasser H 2019 ²²	29,454	0.825	0.782 – 0.868
Moon RC 2020 ²⁴	94	0.875	0.421 – 1.329
Beckmann JH 2020 ²⁵	74	-0.964	-1.457 – -0.471
Total (random effects)	29,738	0.219	-0.539 – 0.977

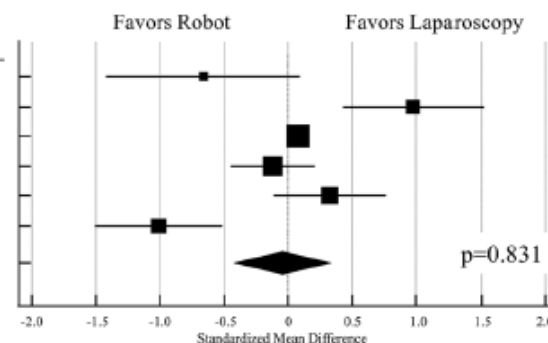
Test for heterogeneity: Significance level $p < 0.001$, I^2 (inconsistency): 95.0%



Length of hospital stay

	Patients	SMD	95% CI
Buchs NC 2014 ²⁰	32	-0.659	-1.419 – -0.101
Gray KD 2018 ²¹	84	0.976	0.431 – 1.521
Nasser H 2019 ²²	29,454	0.080	0.037 – 0.122
King K 2020 ²³	167	-0.116	-0.444 – 0.213
Moon RC 2020 ²⁴	94	0.331	-0.108 – 0.769
Beckmann JH 2020 ²⁵	74	-1.008	-1.504 – -0.513
Total (random effects)	29,738	-0.041	-0.420 – 0.377

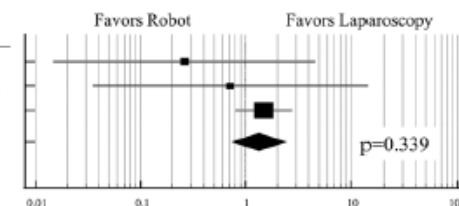
Test for heterogeneity: Significance level $p < 0.001$, I^2 (inconsistency): 86.3%



Conversions to open surgery

	Robotic	Laparoscopic	Relative Risk	95% CI
Buchs NC 2014 ²⁰	0/11	3/21	0.262	0.015 – 4.659
Gray KD 2018 ²¹	0/18	2/66	0.705	0.035 – 14.072
Nasser H 2019 ²²	11/2,307	87/27,147	1.488	0.796 – 2.782
Total (random effects)	11/2,429	92/27,367	1.339	0.736 – 2.438

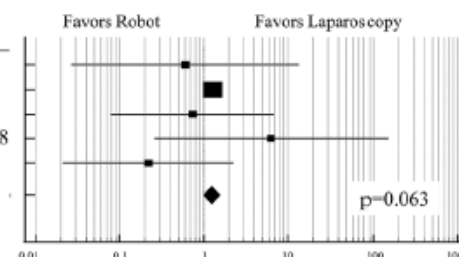
Test for heterogeneity: Significance level $p = 0.459$, I^2 (inconsistency): 0%



Reoperations

	Robotic	Laparoscopic	Relative Risk	95% CI
Buchs NC 2014 ²⁰	0/11	1/21	0.611	0.027 – 13.873
Nasser H 2019 ²²	73/2,307	675/27,147	1.273	1.003 – 1.614
King K 2020 ²³	1/52	3/115	0.737	0.078 – 6.920
Moon RC 2020 ²⁴	1/30	0/64	6.290	0.264 – 150.048
Beckmann JH 2020 ²⁵	1/41	2/18	0.220	0.021 – 2.269
Total (random effects)	76/2,441	681/27,365	1.249	0.988 – 1.578

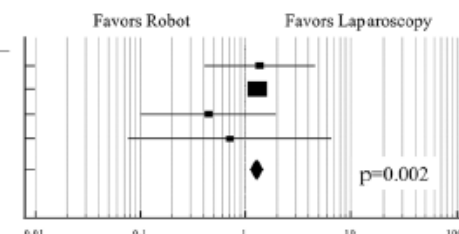
Test for heterogeneity: Significance level $p = 0.468$, I^2 (inconsistency): 0%



Readmissions

	Robotic	Laparoscopic	Relative Risk	95% CI
Gray KD 2018 ²¹	3/18	8/66	1.375	0.406 – 4.659
Nasser H 2019 ²²	166/2,307	1,507/27,147	1.296	1.111 – 1.513
King K 2020 ²³	2/52	10/115	0.442	0.100 – 1.948
Moon RC 2020 ²⁴	1/30	3/64	0.7111	0.077 – 6.566
Total (random effects)	172/2,407	1,528/27,392	1.279	1.099 – 1.489

Test for heterogeneity: Significance level $p = 0.468$, I^2 (inconsistency): 0%

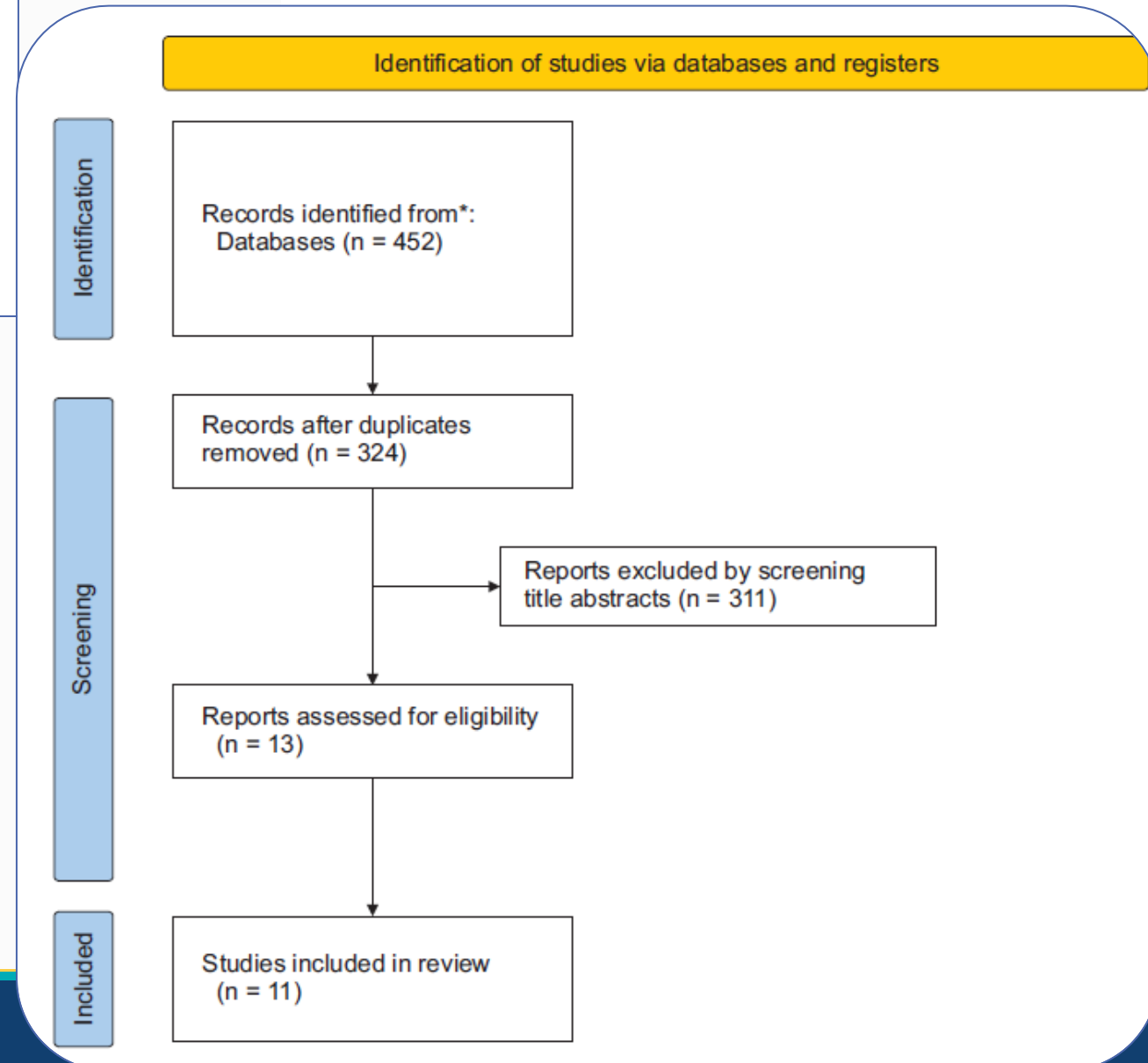


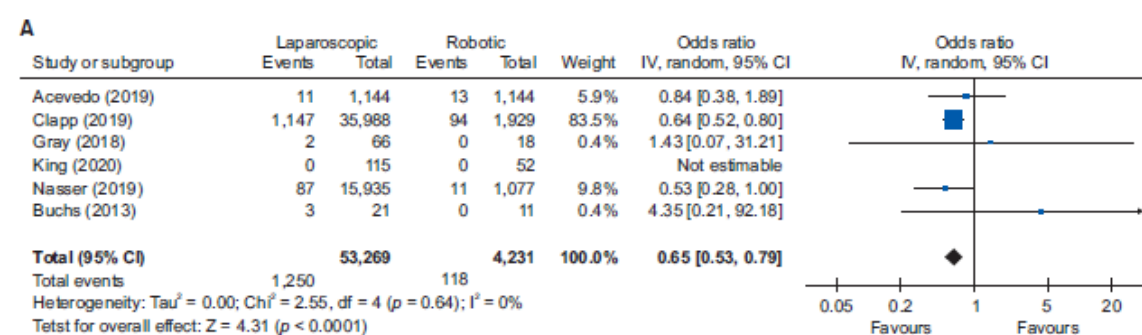


Robotic versus laparoscopic revisional bariatric surgeries: a systematic review and meta-analysis

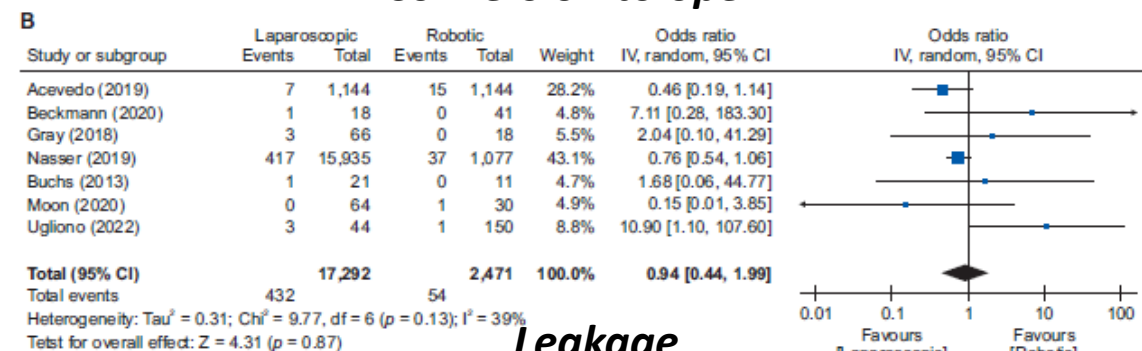
Karim Ataya¹, Hussein El Bourji², Ayman Bsar³, Amir Al Ayoubi⁴, Al Moutuz Al Jaafreh¹, George Abi Saad³

55,889 Laparoscopic vs 5,809 Robotic

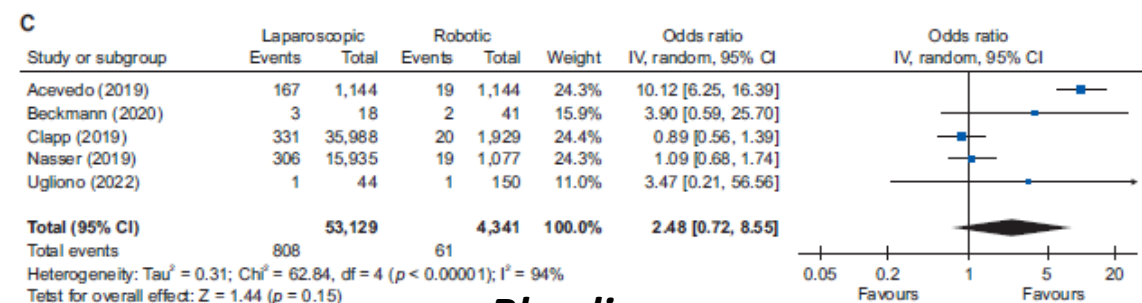




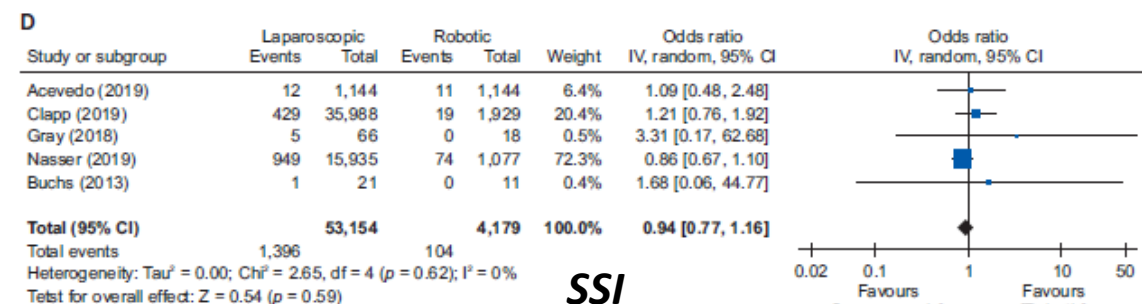
Conversion to open



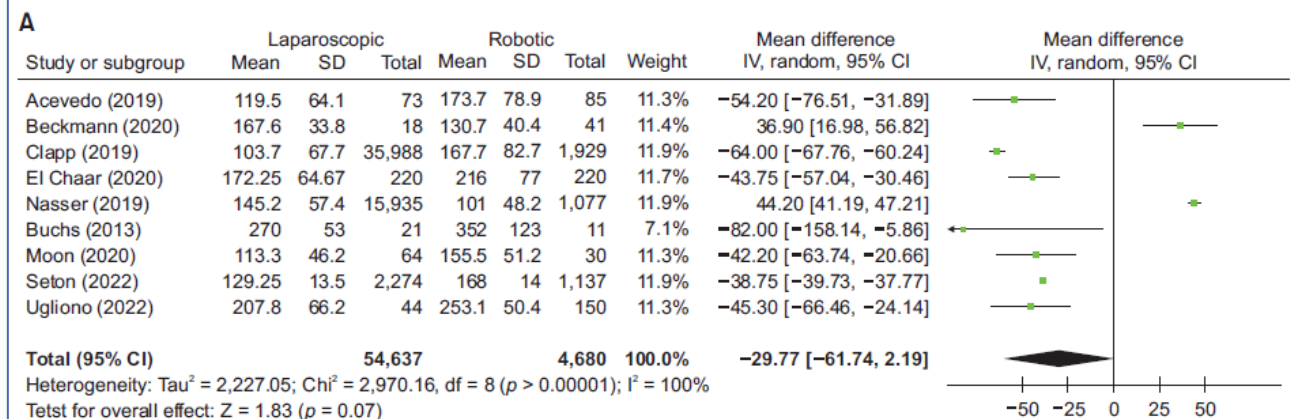
Leakage



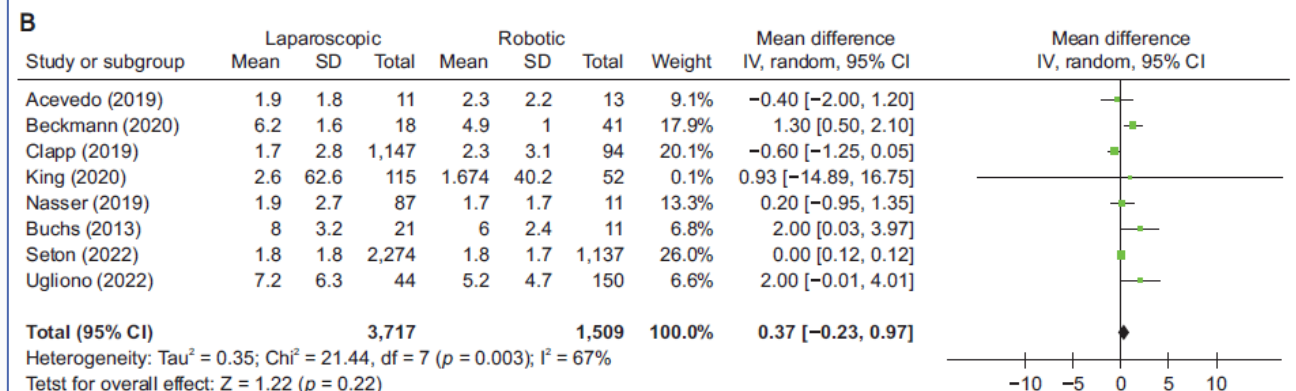
Bleeding



SSI



Operative time



Length of stay



Summary

1. Non inferiority! (considering very large difference in caseload)
 2. Longer OT
 3. Costly
- 

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costs bariatric robotic surgery vs laparoscopic bariatric surgery

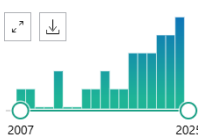
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RESULTS BY YEAR



PUBLICATION DATE

☐ 1 year
☐ 5 years
☐ 10 years
☐ Custom Range

TEXT AVAILABILITY

☐ Abstract

23 results

Page 1 of 3

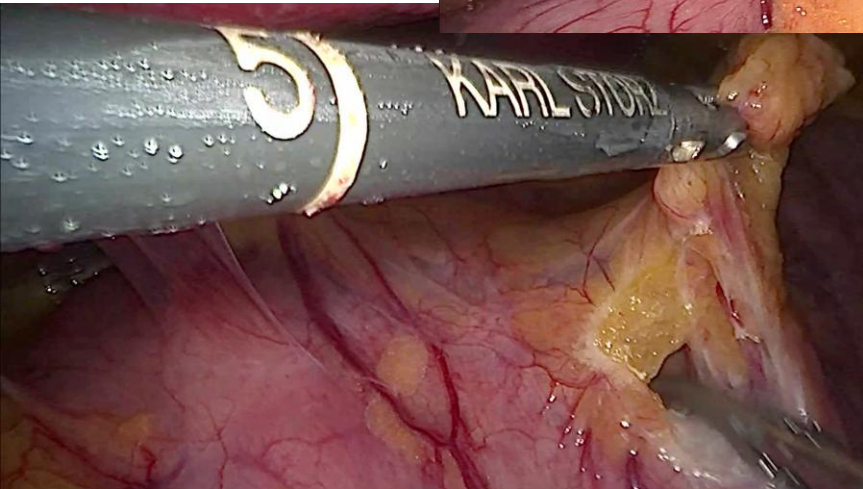
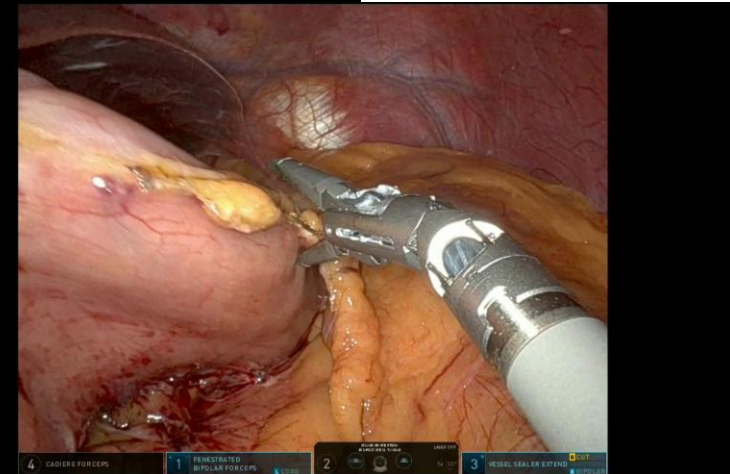
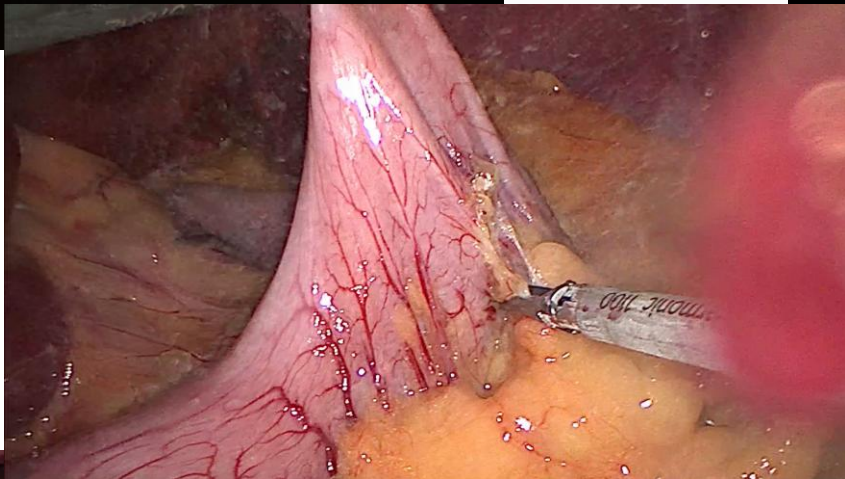
Did you mean **costs bariatric robotic surgery vs laparoscopy bariatric surgery** (22 results)?

☐ 1 **Costs of Robotic and Laparoscopic Bariatric Surgery: A Retrospective Propensity Score-matched Analysis.**
Senatore AM, Mongelli F, Mion FU, Lucchelli M, Garofalo F.
Obes Surg. 2024 Oct;34(10):3694-3702. doi: 10.1007/s11695-024-07477-x. Epub 2024 Aug 27.
PMID: 39190261
PURPOSE: **Robotic bariatric surgery** has not shown significant advantages compared to **laparoscopy**, yet **costs** remain a major concern. The aim of our study was to assess **costs of robotic and laparoscopic bariatric surg ...**

☐ 2 **Robot-assisted vs laparoscopic bariatric procedures in super-obese patients: clinical and economic outcomes.**
Marincola G, Procopio PF, Pennestri F, Gallucci P, Voloudakis N, Ciccoritti L, Greco F, Salvi G, Prioli F, De Crea C, Raffaelli M.
J Robot Surg. 2024 Jan 17;18(1):34. doi: 10.1007/s11701-023-01748-y.
PMID: 38231461 [Free PMC article](#)

4.





Robotic bariatric surgery
One Anastomosis Gastric Bypass

Costs

Availability

Brand competition

Equity

Devoted OR

A LONG WAY TO GO




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Grazie



• **THANK YOU!**



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