Evidence Navigator: Ventral Hernia Repair

Systematic literature review summary
as of March 1, 2024

INTUITIVE

Purpose

The Evidence Navigator is a slide presentation representing a summary of the meta-analysis of the highest level of evidence available specific to a given procedure and published as of a particular date. It is created by the Global Evidence Management team within Global Access, Value and Economics (GAVE). It includes information that is available in the public domain. It is a systematic review and meta-analysis of the peer-reviewed literature based on a timeframe within which a literature search has been conducted according to a set of concise inclusion and exclusion criteria. The results of the meta-analysis are presented in the form of forest plots summarized for each outcome according to a comparator and surgical approach of interest. The summary results are reflective of a specific period in time and are subject to change with increasing literature. All of the robotic-assisted surgery procedures mentioned within the Evidence Navigator were performed using a da Vinci® surgical system.

Statistical analysis

All summary measures are shown as odds ratios, risk ratios or risk differences when describing binary outcomes, or as weighted mean differences or standardized mean differences when describing continuous outcomes. Weighting is based on the study sample size and variability of the outcome. A random effect model is used if heterogeneity is statistically significant, otherwise a fixed effect model is used. The Mantel Haenszel summary statistic is used for the overall results. The meta-analysis is performed with RevMan 5.4 (Review Manager, Version 5.4. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014) or R software (R Foundation for Statistical Computing, Vienna, Austria.URL https://www.R-project.org/).

Interpretation notes

When the effect size is measured as a standardized mean difference (SMD), or a risk difference (RD), it is not possible to provide a quantitative conclusion. In such cases, a qualitative conclusion is given with reference to its statistical significance. In some instances, studies may contain some overlapping patient populations. A redundancy check is performed in order to minimize this overlap and bias due to over-reporting.

Glossary

RAS	robotic-assisted surgery
Lap	laparoscopic surgery
LOE	level of evidence
HTA	health technology assessment
RCT	randomized controlled trial
OR	odds ratio
MD	mean difference
EC	exclusion criteria
RD	risk difference

WMD	weighted mean difference
SMD	standardized mean difference
95% CI	95% confidence interval
I^2	test statistic for heterogeneity
SSI	surgical site infection
EBL	estimated blood loss
LOS	length of hospital stay
HerQLes	Hernia-Related Quality-of-Life Survey
VAS	visual analog scale

Evidence Navigator:
Ventral Hernia Repair
Summary Slides

Systematic literature review summary
as of March 1, 2024

INTUITIVE

WHAT DOES THE LITERATURE SHOW?

Systematic literature review:
Da Vinci robotic-assisted ventral hernia repair

Inclusion criteria

Robotic-assisted ventral hernia repair performed with a da Vinci® surgical system

January 1, 2010 – March 1, 2024

Level of Evidence = 1b, 2b, 2c, 3b

RCT, large database, prospective and retrospective cohort studies (with n≥20 in each cohort)

Exclusion criteria

Not in English

Paper reports on a pediatric population

Publication is an HTA that was not published in a peer-reviewed journal

Alternate technique/approach (e.g. single-port)

No stratified analysis by study arm

Ventral hernia repair data mixed with another procedure/s

Original research study does not provide quantitative results for outcomes of interest

Original research publication includes redundant patient population and similar conclusions

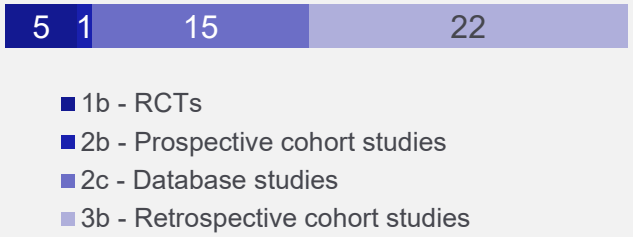
35 publications including

Robotic-assisted patients: **17,118**

Laparoscopic patients: **152,210**

Open patients: **156,376**

Level of evidence



WHAT DOES THE LITERATURE SHOW?

Systematic literature review key points:
Robotic-assisted with da Vinci surgical system vs. laparoscopic ventral hernia repair

Favors robotic-assisted

- ↓ Conversions by **46%**
- ↓ 30-day surgical site infection by **56%**
- ↓ 30-day pain scores (VAS) by **0.8 points**
- ↓ 2-year hernia recurrence by **87%**

Comparable outcomes

- ≈ Postoperative pain medication use at discharge
- ≈ Length of hospital stay
- ≈ Time to return to normal activities
- ≈ 30-day postoperative complications
- ≈ 30-day readmissions
- ≈ 30-day reoperations
- ≈ 30-day emergency department visits
- ≈ 30-day hernia recurrence
- ≈ 90-day hernia recurrence
- ≈ 30-day HerQLes quality of life score
- ≈ 30-day mortality

Favors laparoscopic

- ↓ Operative time by **59 minutes**

Data collected through: March 1, 2024

WHAT DOES THE LITERATURE SHOW?

Systematic literature review key points:
Robotic-assisted with da Vinci surgical system vs. open ventral hernia repair

Favors robotic-assisted

- ↓ Length of hospital stay by **2.6 days**
- ↓ 30-day surgical site infection by **72%**
- ↓ 30-day readmissions by **29%**
- ↓ 30-day hernia recurrence by **84%**
- ↓ Risk of 30-day mortality

Comparable outcomes

- ≈ Postoperative pain medication use at discharge
- ≈ Time to return to normal activities
- ≈ 30-day reoperations
- ≈ 30-day HerQLes quality of life score
- ≈ 30-day post-operative complications

Favors open

- ↓ Operative time by **93 minutes**

Data collected through: March 1, 2024

Evidence Navigator:
Ventral Hernia Repair
Technical Slides

Systematic literature review summary
as of March 1, 2024

INTUITIVE

Ventral hernia repair: Literature search methods
as of March 1, 2024

Monthly searches were conducted in PubMed, Scopus and Embase.

All citations were exported into a reference management system. Duplications were removed. Titles, abstracts and keywords were reviewed for literature review inclusion by Global Evidence Management team.

All robotic-assisted ventral hernia repairs were performed with da Vinci® surgical systems. Publications were identified according to inclusion and exclusion criteria described.

Meta-analysis was performed using RevMan or R software.

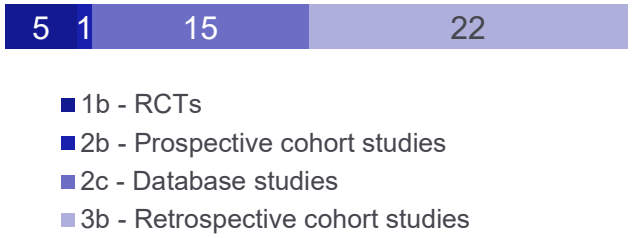
35 publications

17,118 patients who underwent robotic-assisted surgery (RAS)

152,210 patients who underwent laparoscopic surgery (Lap)

156,376 patients who underwent open surgery

Level of evidence



Criteria phase	Details
Identification phase	All robotics publications (library generated from monthly search process) N=39,985 library size at the time of search March 1, 2024
Inclusion criteria 1. Robotic-assisted ventral hernia repair	Da Vinci® robotic-assisted ventral hernia repair N=**330** (excluded N=39,655)
2. Year ≥ 2010	Articles published ≥ 2010 N=**326** (excluded N=4)
3. LOE = 1b, 2b, 2c, 3b	Articles with LOE = 1b, 2b, 2c, 3b N=**57** (excluded N=269)
4. Study is an RCT, prospective or retrospective study or large database study with comparative cohorts (robotic-assisted vs lap and/or open surgery) and sample size N≥20	Comparator cohorts N=**51** (excluded N=6)
Exclusion criteria 1. Not in English 2. Paper reports on a pediatric population 3. Publication is an HTA that was not published in a peer-reviewed journal 4. Alternate technique/approach (e.g. single-port) 5. No stratified analysis by study arm (e.g., combines results from robotic, lap and/or open cohorts) 6. Ventral hernia repair data mixed with another procedure/s 7. Original research study does not provide quantitative results for at least one of the findings relative to the outcomes of interest 8. Original research publication includes redundant patient population and similar conclusions	**N=16 excluded publications:** N=0 (EC#1) N=0 (EC#2) N=0 (EC#3) N=0 (EC#4) N=8 (EC#5) N=1 (EC#6) N=7 (EC#7) N=0 (EC#8) N=0 (EC#9)

Robotic-assisted ventral hernia repair publications: N=35

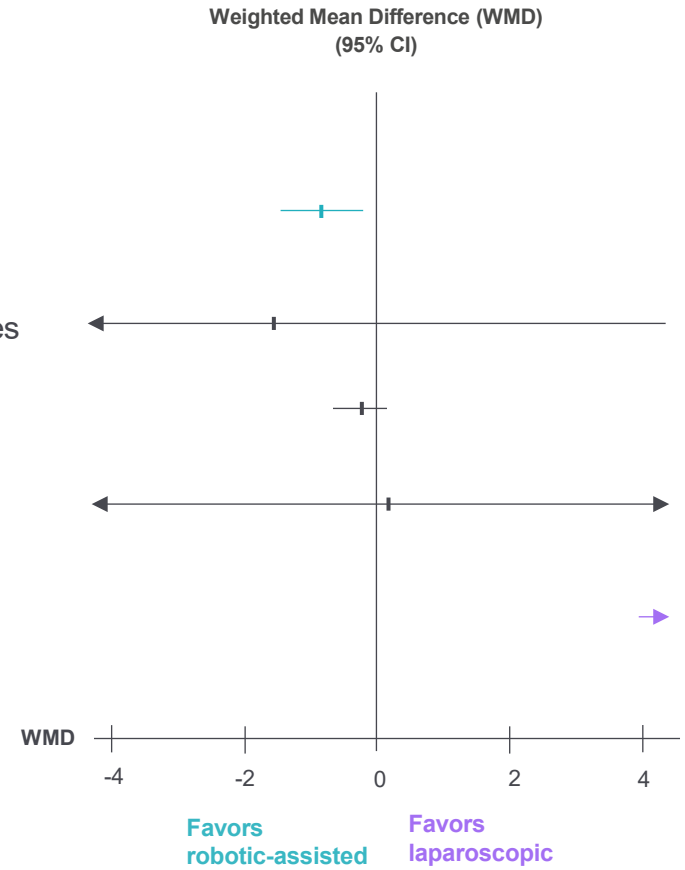
Robotic-assisted vs. laparoscopic ventral hernia repair

Summary as of March 1, 2024

- Significant difference favoring robotic-assisted surgery
- No significant difference; comparable outcomes
- Significant difference favoring laparoscopic surgery

Compared to laparoscopic ventral hernia repair, the evidence for **robotic-assisted ventral hernia repair using the da Vinci surgical system** demonstrates:

- Significantly lower pain scores (VAS) at 30-days follow-up by an average of 0.8 points
- Comparable time to return to normal activities
- Comparable length of hospital stay
- Comparable quality of life HerQLes score at 30-days follow-up
- Significantly longer operative time by an average of 59 minutes



Outcome	Robotic-assisted, n	Lap, n	Effect size 95% CI	P-value
Ventral hernia repair continuous variables (to March 1, 2024)				
Pain Score (VAS) at 30 days, n [27, 29]				
Subtotal	103	94	-0.80 [-1.40,-0.20]	p<0.01
Fixed, Heterogeneity: p=0.19; I^2=41%				
Return to normal activities, days [13, 23]				
Subtotal	236	382	-1.50 [-6.98, 3.99]	p=0.59
Random, Heterogeneity: p<0.01; I^2=94%				
Length of Stay, days [1-3,6-8,13, 15, 20, 22-24, 29, 32, 34, 35]				
Subtotal	7677	77094	-0.20 [-0.62, 0.22]	p=0.35
Random, Heterogeneity: p<0.01; I^2=96%				
HerQLes at 30-days, score (L-R) [23, 29]				
Subtotal	198	118	0.27 [-6.06, 6.61]	p=0.93
Fixed, Heterogeneity: p=0.16; I^2=49%				
Operative Time, min [6, 7, 13, 15, 23, 24, 27, 29, 34, 35]				
Subtotal	754	904	58.82 [39.55, 78.08]	p<0.01
Random, Heterogeneity: p<0.01; I^2=91%				

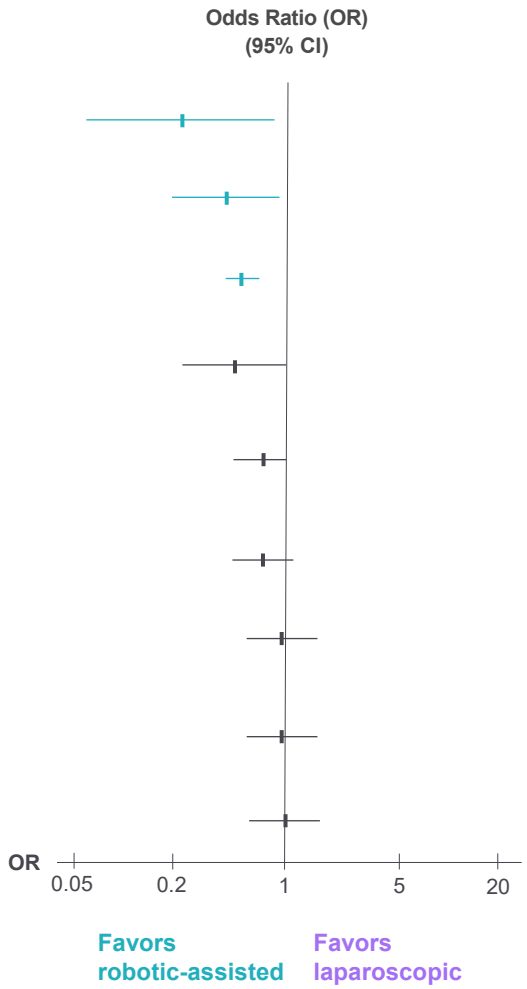
Robotic-assisted vs. laparoscopic ventral hernia repair

Summary as of March 1, 2024

Significant difference favoring robotic-assisted surgery | No significant difference; comparable outcomes | Significant difference favoring laparoscopic surgery

Compared to laparoscopic ventral hernia repair, the evidence for **robotic-assisted ventral hernia repair using the da Vinci surgical system** demonstrates:

- 87% less likely to experience a hernia recurrence at 2-years follow-up
- 56% less like to experience a surgical site infection within 30-days of surgery
- 46% less likely to be converted to open surgery
- Comparable reoperations rate within 30-days of surgery
- Comparable post-operative pain medication use rate at discharge
- Comparable post-operative complications rate within 30-days of surgery
- Comparable readmissions rate within 30-days of surgery
- Comparable mortality rate within 30-days of surgery
- Comparable emergency department visit rate within 30-days of surgery



Outcome	Robotic-assisted, n	Lap, n	Effect size 95% CI	P-value
Ventral hernia repair binary variables (to March 1, 2024)				
Hernia recurrence at 2-years, n [12, 15]				
Subtotal	121	114	0.23 [0.06, 0.85]	p=0.03
Fixed, Heterogeneity: p=0.81; I²=0%				
Surgical site infection, n [6, 7, 11, 13, 15, 22, 27, 34, 35]				
Subtotal	1054	1233	0.44 [0.21, 0.92]	p=0.03
Fixed, Heterogeneity: p=0.55; I²=0%				
Conversions, n [15, 22, 23, 27, 33, 35]				
Subtotal	3703	38293	0.54 [0.44, 0.66]	p<0.01
Fixed, Heterogeneity: p=0.44; I²=0%				
Reoperations, n [9- 7, 13, 15 22-24, 27, 29, 32, 35]				
Subtotal	1283	1764	0.48 [0.23, 1.02]	p=0.06
Fixed, Heterogeneity: p=0.81; I²=0%				
Postoperative pain medication use, n [2, 23]				
Subtotal	624	6911	0.72 [0.50, 1.03]	p=0.07
Fixed, Heterogeneity: p=0.27; I²=16%				
Post-operative complications, n [1, 2, 6, 13, 15, 22-24, 29, 32]				
Subtotal	2320	9111	0.72 [0.46, 1.12]	p=0.15
Random, Heterogeneity: p<0.01; I²=78%				
Readmissions, n [1, 2, 7, 11, 13, 22-24, 29, 32, 35]				
Subtotal	2797	28975	0.94 [0.59, 1.49]	p=0.79
Random, Heterogeneity: p=0.01; I²=55%				
Mortality, n [2, 3, 8, 15, 22, 32, 35]				
Subtotal	6339	51920	0.95 [0.57, 1.58]	p=0.84
Fixed, Heterogeneity: p=0.47; I²=0%				
Emergency department visit, n [1, 13, 22, 27]				
Subtotal	2949	20164	0.99 [0.58, 1.68]	p=0.97
Random, Heterogeneity: p=0.05; I²=61%				

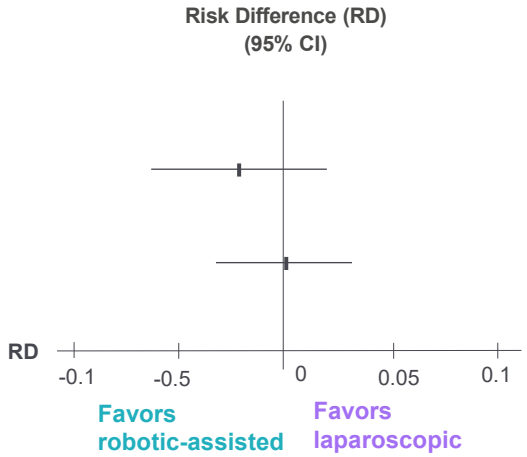
Robotic-assisted vs. laparoscopic ventral hernia repair

Summary as of March 1, 2024

- Significant difference favoring robotic-assisted surgery
- No significant difference; comparable outcomes
- Significant difference favoring laparoscopic surgery

Compared to laparoscopic ventral hernia repair, the evidence for **robotic-assisted ventral hernia repair using the da Vinci surgical system** demonstrates:

- Comparable hernia recurrence rate at 30-day follow-up
- Comparable hernia recurrence rate at 90-day follow-up



Outcome	Robotic-assisted, n	Lap, n	Effect size 95% CI	P-value
Ventral hernia repair binary variables (to March 1, 2024)				
Hernia recurrence at 30-days, n [6, 11, 13, 23]				
Subtotal	335	468	-0.0205 [0.0606, 0.0195]	p=0.32
Random, Heterogeneity: p<0.01; I^2=75%				
Hernia recurrence at 90-days, n [24, 27, 34]				
Subtotal	293	251	0.0014 [-0.0294, 0.0322]	p=0.93
Fixed, Heterogeneity: p=0.90; I^2=0%				

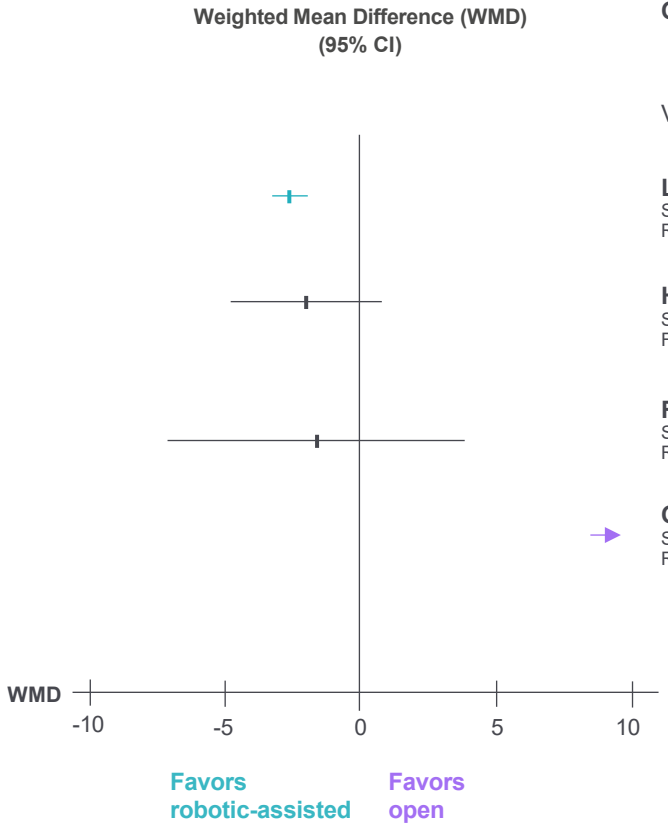
Robotic-assisted vs. open ventral hernia repair

Summary as of March 1, 2024

- Significant difference favoring robotic-assisted surgery
- No significant difference; comparable outcomes
- Significant difference favoring open surgery

Compared to open ventral hernia repair, the evidence for **robotic-assisted ventral hernia repair using the da Vinci surgical system** demonstrates:

- Significantly shorter length of hospital stay by an average of 2.6 days
- Comparable quality of life HerQLes score at 30-days follow-up
- Comparable time to return to normal activities
- Significantly longer operative time by an average of 93 minutes



Outcome	Robotic-assisted, n	Open, n	Effect size 95% CI	P-value
Ventral hernia repair continuous variables (to March 1, 2024)				
Length of Stay, days [2, 4, 5, 9, 10, 13, 16-18, 23, 25, 28, 31]				
Subtotal	2600	43732	-2.57 [-3.23, -1.92]	p<0.01
Random, Heterogeneity: p<0.01; I^2=95%				
HerQLes at 30-days, score (L-R) [16, 23, 28]				
Subtotal	866	989	-1.98 [-4.82, 0.86]	p=0.17
Fixed, Heterogeneity: p=0.181; I^2=41%				
Return to normal activities, days [13, 23]				
Subtotal	236	548	-1.58 [-7.07, 3.90]	p=0.57
Random, Heterogeneity: p<0.01; I^2=95%				
Operative Time, min [4, 10, 13, 17, 23, 25, 31]				
Subtotal	439	748	92.79 [39.27, 146.32]	p<0.01
Random, Heterogeneity: p<0.01; I^2=96%				

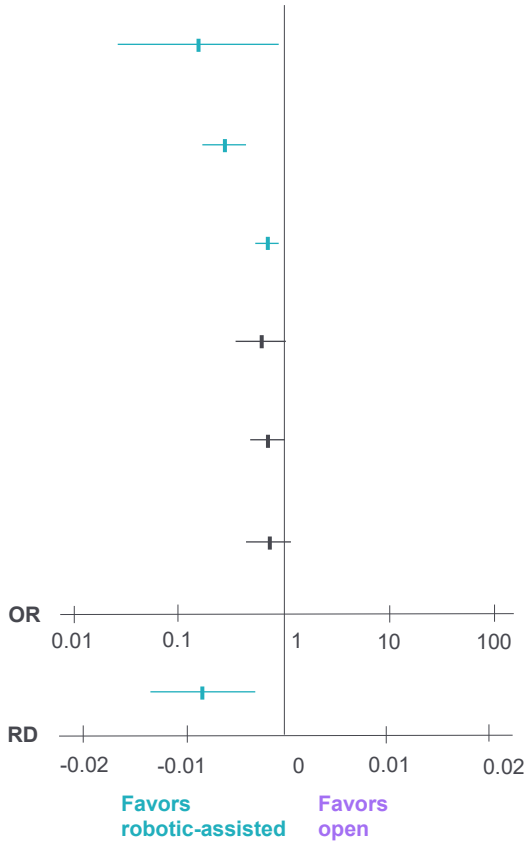
Robotic-assisted vs. open ventral hernia repair

Summary as of March 1, 2024

Significant difference favoring robotic-assisted surgery | No significant difference; comparable outcomes | Significant difference favoring open surgery

Compared to open ventral hernia repair, the evidence for **robotic-assisted ventral hernia repair using the da Vinci surgical system** demonstrates:

- 84% less likely to experience a hernia recurrence at 30-days follow-up
- 72% less like to experience a surgical site infection within 30-days of surgery
- 29% less likely to be readmitted to hospital within 30-days of surgery
- Comparable reoperations rate within 30-days of surgery
- Comparable postoperative complications rate within 30-days of surgery
- Comparable postoperative pain medication use rate at discharge
- Lower risk of mortality within 30-days of surgery



Outcome	Robotic-assisted, n	Open, n	Effect size 95% CI	P-value
Ventral hernia repair binary variables (to March 1, 2024)				
Hernia recurrence at 30 days, n [13, 23, 28]				
Subtotal	901	1213	0.16 [0.03, 0.0.95]	p=0.04
Fixed, Heterogeneity: p=0.82; I²=0%				
Surgical site infection, n [5, 9, 10, 13, 14, 16, 21, 25, 28]				
Subtotal	1693	2836	0.28 [0.18, 0.44]	p<0.01
Fixed, Heterogeneity: p=0.65; I²=0%				
Readmissions, n [2, 4, 5, 9, 10, 13, 14, 16, 21, 23, 25, 28]				
Subtotal	2343	42549	0.71 [0.56, 0.90]	p<0.01
Fixed, Heterogeneity: p=0.40; I²=5%				
Reoperations, n [5, 13, 14, 16, 23, 28, 31]				
Subtotal	1286	1882	0.62 [0.35, 1.09]	p=0.10
Fixed, Heterogeneity: p=0.85; I²=0%				
Postoperative complications, n [2, 4, 9, 10, 13, 23, 25, 28, 31]				
Subtotal	1865	41674	0.69 [0.49, 0.96]	p=0.03
Random, Heterogeneity: p<0.01; I²=67%				
Postoperative pain medication use, n [2, 23]				
Subtotal	624	39635	0.76 [0.46, 1.26]	p=0.29
Random, Heterogeneity: p=0.14; I²=54%				
Mortality, n [2, 4, 5, 9, 10, 16, 17, 25, 28, 31]				
Subtotal	1836	41663	-0.0084 [-0.0135, -0.0034]	p<0.01
Fixed, Heterogeneity: p=0.91; I²=0%				

Ventral hernia repair bibliography (1 of 2)

March 1, 2024

1. Altieri, M. S.-.-Y., J. Xu, J. Talamini, M. Pryor, A. Telem, D. A. (2018). Outcomes after Robotic Ventral Hernia Repair: A Study of 21,565 Patients in the State of New York. [2c]. The American surgeon, 84(6), 902-908. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/29981622
2. Armijo, P.-.-P., A. Wang, Y. Shostrom, V. Oleynikov, D. (2017). Robotic ventral hernia repair is not superior to laparoscopic: a national database review. [2c]. Surg Endosc. doi:10.1007/s00464-017-5872-7
3. Ayuso, S. A.-.-K., M. M. Aladegbami, B. G. Nayak, R. B. Augenstein, V. A. Heniford, B. T. Colavita, P. D. (2021). Nationwide Readmissions Analysis of Minimally Invasive Versus Open Ventral Hernia Repair: A Retrospective Population-Based Study. [2c]. The American surgeon, 31348211050835. doi:10.1177/00031348211050835
4. Bittner, J. G.-.-A., S. Vy, M. Mabe, M. Del Prado, P. A. R. Clingempeel, N. L. (2017). Comparative analysis of open and robotic transversus abdominis release for ventral hernia repair. [3b]. Surg Endosc. doi:10.1007/s00464-017-5729-0
5. Carbonell, A. M.-.-W., J. A. Prabhu, A. S. Ballecer, C. D. Janczyk, R. J. Herrera, J. Huang, L. C. Phillips, S. Rosen, M. J. Poulose, B. K. (2017). Reducing Length of Stay Using a Robotic-assisted Approach for Retromuscular Ventral Hernia Repair: A Comparative Analysis From the Americas Hernia Society Quality Collaborative. [2c]. Annals of Surgery. doi:10.1097/SLA.0000000000002244
6. Chen, Y. J.-.-H., D. Nguyen, S. Chin, E. Divino, C. Zhang, L. (2016). Outcomes of robot-assisted versus laparoscopic repair of small-sized ventral hernias. [3b]. Surg Endosc. doi:10.1007/s00464-016-5106-4
7. Christoffersen, M. W.-.-J., L. N. Jensen, K. K. (2022). Less postoperative pain and shorter length of stay after robot-assisted retrorectus hernia repair (rRetrorectus) compared with laparoscopic intraperitoneal onlay mesh repair (IPOM) for small or medium-sized ventral hernias. [3b]. Surgical Endoscopy. doi:10.1007/s00464-022-09608-w
8. Coakley, K. M.-.-S., S. M. Prasad, T. Lincourt, A. E. Augenstein, V. A. Sing, R. F. Heniford, B. T. Colavita, P. D. (2017). A nationwide evaluation of robotic ventral hernia surgery. [2c]. American Journal of Surgery, 214(6), 1158-1163. doi:10.1016/j.amjsurg.2017.08.022
9. Collins, C. E.-.-R., S. Huang, L. C. Phillips, S. Gure, T. R. Poulose, B. (2021). Robotic vs Open Approach for Older Adults Undergoing Retromuscular Ventral Hernia Repair. [2c]. Ann Surg. doi:10.1097/sla.0000000000005260
10. Dewulf, M.-.-H., J. M. Mäkäräinen, E. Saarnio, J. Vierstraete, M. Ohtonen, P. Muysoms, F. Rautio, T. (2022). Open versus robotic-assisted laparoscopic posterior component separation in complex abdominal wall repair. [3b]. BJS open, 6(3). doi:10.1093/bjsopen/zrac057
11. Dhanani, N. H.-.-O., O. A. Holihan, J. L. Shah, S. K. Wilson, T. D. Loor, M. M. Ko, T. C. Kao, L. S. Liang, M. K. (2021). Robotic versus Laparoscopic Ventral Hernia Repair: One-year Results from a Prospective, Multicenter, Blinded Randomized Controlled Trial. [1b]. Ann Surg. doi:10.1097/sla.0000000000004795
12. Dhanani, N. H.-.-L., N. B. Olavarria, O. A. Bernardi, K. Holihan, J. L. Shah, S. K. Wilson, T. D. Loor, M. M. Kao, L. S. Liang, M. K. (2023). Robotic versus Laparoscopic Ventral Hernia Repair: Two-year Results from a Prospective, Multicenter, Blinded Randomized Clinical Trial. [1b]. Ann Surg, 278(2), 161-165. doi:10.1097/sla.0000000000005903
13. Forester, B.-.-A., M. Donovan, K. Kuchta, K. Ujiki, M. Denham, W. Haggerty, S. P. Carbray, J. A. Linn, J. (2020). Short-term quality of life comparison of laparoscopic, open, and robotic incisional hernia repairs. [3b]. Surgical Endoscopy. doi:10.1007/s00464-020-07711-4
14. Gaskins, J.-.-H., L. C. McPhail, L. O'Connor, S. (2023). Robotic approach for retromuscular ventral hernia repair may be associated with improved wound morbidity in high-risk patients: a propensity score analysis. [2c]. Surgical Endoscopy, 38(2), 1013-1019. doi:10.1007/s00464-023-10630-9
15. Gonzalez, A. M.-.-R., R. J. Seetharamaiah, R. Gallas, M. Lamoureux, J. Rabaza, J. R. (2014). Laparoscopic ventral hernia repair with primary closure versus no primary closure of the defect: potential benefits of the robotic technology. [3b]. Int J Med Robot. doi:10.1002/rcs.1605
16. Guzman-Pruneda, F. A.-.-H., L. C. Collins, C. Renshaw, S. Narula, V. K. Poulose, B. (2020). Abdominal core quality of life after ventral hernia repair: a comparison of open versus robotic-assisted retromuscular techniques. [2c]. Surgical Endoscopy. doi:10.1007/s00464-020-07386-x
17. Hennessey, R. Q. L.-.-Y., Y. Meneghetti, A. T. Panton, O. N. M. Chiu, C. J. (2023). A cost-conscious establishment of a robotic abdominal wall reconstruction program in a publicly funded healthcare system. [3b]. Hernia. doi:10.1007/s10029-023-02823-x
18. Henriksen, N. A.-.-H., F. Jensen, K. K. (2023). Short-term outcomes after open versus robot-assisted repair of ventral hernias: a nationwide database study. [2c]. Hernia. doi:10.1007/s10029-023-02923-8
19. Howard, R.-.-T., J. Ehlers, A. Englesbe, M. Dimick, J. Telem, D. (2023). Trends in Surgical Technique and Outcomes of Ventral Hernia Repair in the United States. [2c]. Annals of Surgery, 278(2), 274-279. doi:10.1097/SLA.0000000000005654
20. Khorgami, Z.-.-L., W. T. Jackson, T. N. Howard, C. A. Sclabas, G. M. (2018). The cost of robotics: an analysis of the added costs of robotic-assisted versus laparoscopic surgery using the National Inpatient Sample. [2c]. Surgical Endoscopy. doi:10.1007/s00464-018-6507-3

Ventral hernia repair bibliography (2 of 2)

March 1, 2024

21. Kushner, B. S.-.-H., B. Holden, S. E. Majumder, A. Blatnik, J. A. (2021). Does immunosuppression use increase perioperative wound morbidity in patients undergoing transversus abdominis release? [3b]. Surgery. doi:10.1016/j.surg.2021.08.006
22. LaPinska, M.-.-K., K. Webb, L. Stewart, T. G. Olson, M. (2020). Robotic-assisted and laparoscopic hernia repair: real-world evidence from the Americas Hernia Society Quality Collaborative (AHSQC). [2c]. Surg Endosc. doi:10.1007/s00464-020-07511-w
23. LeBlanc, K. A.-.-G., A. Dickens, E. Olsofka, J. Ortiz-Ortiz, C. Verdeja, J. C. Pierce, R. the Prospective Hernia Study, Group. (2021). Robotic-assisted, laparoscopic, and open incisional hernia repair: early outcomes from the Prospective Hernia Study. [3b]. Hernia. doi:10.1007/s10029-021-02381-0
24. Lu, R.-.-A., A. Ewart, Z. Broda, A. Parlacoski, S. Zahiri, H. R. Belyansky, I. (2019). Comparative review of outcomes: laparoscopic and robotic enhanced-view totally extraperitoneal (eTEP) access retrorectus repairs. [3b]. Surg Endosc. doi:10.1007/s00464-019-07132-y
25. Martin-Del-Campo, L. A.-.-W., A. S. Belyansky, I. Novitsky, Y. W. (2017). Comparative analysis of perioperative outcomes of robotic versus open transversus abdominis release. [3b]. Surg Endosc. doi:10.1007/s00464-017-5752-1
26. Mehaffey, J. H.-.-M., A. D. Mullen, M. G. Yount, K. W. Meneveau, M. O. Smith, P. W. Friel, C. M. Schirmer, B. D. (2017). Adoption of robotics in a general surgery residency program: at what cost? [3b]. Journal of Surgical Research, 213, 269-273. doi:10.1016/j.jss.2017.02.052
27. Olavarria, O. A.-.-B., K. Shah, S. K. Wilson, T. D. Wei, S. Pedroza, C. Avritscher, E. B. Loor, M. M. Ko, T. C. Kao, L. S. Liang, M. K. (2020). Robotic versus laparoscopic ventral hernia repair: Multicenter, blinded randomized controlled trial. [1b from 3b AY]. The BMJ, 370, m2457. doi:10.1136/bmj.m2457
28. Pereira, X.-.-L., D. L. Huang, L. C. Salas-Parra, R. Shah, P. Malcher, F. Sreeramoju, P. (2022). Robotic versus open lateral abdominal hernia repair: a multicenter propensity score matched analysis of perioperative and 1-year outcomes. [3b]. Hernia. doi:10.1007/s10029-022-02713-8
29. Petro, C. C.-.-Z., S. Krpata, D. Alkhatib, H. Tu, C. Rosen, M. J. Prabhu, A. S. (2020). Patient-Reported Outcomes of Robotic vs Laparoscopic Ventral Hernia Repair with Intraperitoneal Mesh: The PROVE-IT Randomized Clinical Trial. [1b]. JAMA Surgery. doi:10.1001/jamasurg.2020.4569
30. Petro, C. C.-.-T., J. D. Tu, C. Krpata, D. M. Beffa, L. R. Rosen, M. J. Prabhu, A. S. (2022). Robotic vs Laparoscopic Ventral Hernia Repair with Intraperitoneal Mesh: 1-Year Exploratory Outcomes of the PROVE-IT Randomized Clinical Trial. [1b]. J Am Coll Surg, 234(6), 1160-1165. doi:10.1097/XCS.0000000000000171
31. Plitzko, G. A.-.-S., B. O. Giannou, A. Reeh, M. Izbicki, J. R. Melling, N. Tachezy, M. (2023). Robotic-assisted repair of incisional hernia-early experiences of a university robotic hernia program and comparison with open and minimally invasive sublay technique (eMILOS). [3b]. Langenbecks Arch Surg, 408(1), 396. doi:10.1007/s00423-023-03129-3
32. Prabhu, A. S.-.-D., E. O. Copper, C. M. Mann, J. W. Yunis, J. P. Phillips, S. Huang, L. C. Poulose, B. K. Rosen, M. J. (2017). Laparoscopic vs Robotic Intraperitoneal Mesh Repair for Incisional Hernia: An Americas Hernia Society Quality Collaborative Analysis. [2c]. J Am Coll Surg. doi:10.1016/j.jamcollsurg.2017.04.011
33. Shah, P. C.-.-d. G., A. Cerfolio, R. Huang, W. C. Huang, K. Song, C. Li, Y. Kreaden, U. Oh, D. S. (2022). Impact of type of minimally invasive approach on open conversions across ten common procedures in different specialties. [2c]. Surg Endosc. doi:10.1007/s00464-022-09073-5
34. Walker, P. A.-.-M., A. C. Mo, J. Cherla, D. V. Santillan, M. R. Kim, S. Ryan, H. Shah, S. K. Wilson, E. B. Tsuda, S. (2018). Multicenter review of robotic versus laparoscopic ventral hernia repair: is there a role for robotics? [3b]. Surgical Endoscopy and Other Interventional Techniques, 1-5. doi:10.1007/s00464-017-5882-5
35. Warren, J. A.-.-C., W. S. Ewing, J. A. Carbonell, A. M. (2016). Standard laparoscopic versus robotic retromuscular ventral hernia repair. [3b]. Surgical Endoscopy and Other Interventional Techniques, 1-9. doi:10.1007/s00464-016-4975-x

Disclosures

Important Safety Information

(US) Serious complications may occur in any surgery, including da Vinci surgery, up to and including death. Serious risks include, but are not limited to, injury to tissues and organs and conversion to other surgical techniques which could result in a longer operative time and/or increased complications. For summary of the risks associated with surgery refer to www.intuitive.com/safety.

Da Vinci Xi®/da Vinci X® system precaution statement
The demonstration of safety and effectiveness for the representative specific procedures did not include evaluation of outcomes related to the treatment of cancer (overall survival, disease-free survival, local recurrence), except for radical prostatectomy which was evaluated for overall survival, or treatment of the patient's underlying disease/condition. Device usage in all surgical procedures should be guided by the clinical judgment of an adequately trained surgeon.

(EU) Medical devices, CE 2460, refer to Instructions For Use for further information.

For product intended use and/or indications for use, risks, cautions, and warnings and full prescribing information, refer to the associated user manual(s) or visit https://manuals.intuitivesurgical.com/market.

Some products, features or technologies may not be available in all countries. Please contact your local Intuitive representative for product availability in your region.

Individual outcomes may depend on a number of factors, including but not limited to patient characteristics, disease characteristics, and/or surgeon experience.

Privacy Notice: Intuitive's Privacy Notice is available at www.intuitive.com/privacy.

intuitive.com