



Comparative Analysis of Patient Outcomes and Hospital Costs: Robotic-Assisted Surgery versus Conventional Laparoscopic Surgery across Five Procedures

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BACKGROUND

- The benefit of using robotic-assisted surgery (RAS) over conventional laparoscopic surgery (CLS) remains controversial given the high cost of the technology.
- This study aimed to determine the benefits of minimally invasive RAS over CLS across five procedures.
 - Inpatient:** Colectomy, Gastrectomy, Total Hysterectomy
 - Outpatient:** Cholecystectomy, Inguinal Hernia Repair

METHODS

- Adult patients undergoing any of these procedures at a U.S. hospital with an index discharge date between January 1, 2018 and June 30, 2022 were identified using the PINC AI™ Healthcare Database, which represents over one billion patient encounters.
- Generalized linear model regressions were used to model operating room (OR) procedure time and cost and total cost at index visit, and to calculate adjusted mean predicted index visit clinical and cost outcomes.
- Mean predicted values were adjusted for gender (except for hysterectomy), age, race, ethnicity, payor, patient comorbidities, number of hospital beds, rural vs. urban setting, U.S. geographic region, and hospital teaching status and 95% CIs were calculated.

RESULTS

- 1,343,018 adult patients (13.3% RAS, 86.7% CLS) were included.
 - Colectomy (n=119,373)
 - Gastrectomy (n=146,121)
 - Total Hysterectomy (n=106,092)
 - Cholecystectomy (n=781,675)
 - Inguinal Hernia Repair (n=189,757)

Table 1. Patient counts by surgical approach across five targeted procedures

	Colectomy	Gastrectomy	Total Hysterectomy	Cholecystectomy	Inguinal Hernia Repair
RAS	40,155 (34%)	23,188 (16%)	33,686 (32%)	39,833 (5%)	42,402 (22%)
CLS	79,218 (66%)	122,933 (84%)	72,406 (68%)	741,842 (95%)	147,355 (78%)
Total	119,373	146,121	106,092	781,675	189,757

- Lower mean predicted index visit total cost, OR cost, and OR time was observed for all CLS procedures compared to RAS procedures.**
 - All **inpatient** procedures for CLS versus RAS demonstrated lower mean predicted index visit total cost, OR cost, and OR time, with reductions of \$3,664, \$2,653, and 42.7 minutes, respectively (all p values <.0001).

Table 2. Mean predicted outcomes across selected inpatient procedures

	Index Visit Total Cost (95% CI)	OR Cost (95% CI)	OR Time in Minutes (95% CI)
	N=305,592	N=305,229	N=15,871
RAS	\$19,906 (\$19,801-\$20,011)	\$8,807 (\$8,755-\$8,859)	151.0 (147.0-154.0)
CLS	\$16,242 (\$16,169-\$16,316)	\$6,154 (\$6,122-\$6,185)	108.0 (105.0-110.0)
Difference	\$3,664 (\$3,593-\$3,735)	\$2,653 (\$2,167-\$2,689)	42.7 (40.1-45.2)
p	<.0001	<.0001	<.0001

- All **outpatient** procedures for CLS versus RAS exhibited lower mean predicted index visit total cost, OR cost, and OR time by \$1,596, \$1,082, and 17.6 minutes, respectively (all p values <.0001).

Table 3. Mean predicted outcomes across selected outpatient procedures

	Index Visit Total Cost (95% CI)	OR Cost (95% CI)	OR Time in Minutes (95% CI)
	N=713,753	N=712,734	N=37,751
RAS	\$8,850 (\$8,814-\$8,905)	\$5,523 (\$5,494-\$5,552)	84.9 (83.3-86.6)
CLS	\$7,264 (\$7,239-\$7,289)	\$4,441 (\$4,426-\$4,457)	67.3 (66.4-68.3)
Difference	\$1,596 (\$1,558-\$1,633)	\$1,082 (\$1,059-\$1,105)	17.6 (16.3-18.9)
p	<.0001	<.0001	<.0001

- Of the three inpatient procedures, a modest proportion of CLS colectomy patients experienced postprocedural infections compared to their RAS counterparts.

DISCUSSION

- Our study suggests an association between utilizing the CLS approach and lower mean predicted index visit total cost, OR cost, and OR time compared to the RAS approach across the five targeted inpatient (colectomy, gastrectomy, total hysterectomy) and outpatient (cholecystectomy, inguinal hernia repair) procedures.
- Utilizing RAS was associated with higher costs and longer OR duration, and it did not result in statistically superior treatment outcomes. The only exception was a lower rate of postprocedural infections among the RAS colectomy patients compared to CLS colectomy patients.
- Reducing hospital expenditure and OR time may optimize the use of a facility's resources, improve patient throughput, improve patients' experience, and improve a facility's overall efficiency.

CONCLUSION

- The RAS benefits of fewer infections during colectomy may not justify its substantially higher cost across the other four procedures.
- Despite the growing appeal of RAS, financially constrained hospitals will benefit from investing in or switching to CLS given the higher costs and reduced OR efficiency of RAS, particularly for ambulatory procedures.

REFERENCE

- PINC AI™ Applied Sciences. PINC AI™ Healthcare Database: Data That Informs and Performs. 2023.

CONTACT/DISCLOSURE

- michelle.sosa@stryker.com
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