Contemporary Trends and Outcomes of Laparoscopic and Robotic Repair for Perforated Peptic Ulcer Disease

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BACKGROUND

- The advantages of laparoscopic repair for perforated peptic ulcer (PPU) disease have long been reported.
- However, recent changes including the adoption of robotic platforms and any associated outcome benefits remain unclear.

OBJECTIVE

- To analyze contemporary trends in the use of laparoscopic and robotic approaches for PPU repair and compare their clinical outcomes to the open approach.

METHODS

DESIGN: A retrospective cohort study

SETTING:

National Inpatient Sample data from 2016 to 2021 in the US

PARTICIPANTS:

Adult patients (age≥18 years) who underwent nonelective surgical repair of PPU

MAIN OUTCOME MEASURES:

☐ National trends in laparoscopic and robotic approaches

➢ **Annual percent change (APC)** using a generalized linear model assuming a Poisson distribution, stratified by **rurality** and **teaching status**.

☐ Mortality, complications, length of stay, hospital charges

➢ Multivariable linear and logistic regressions were used to assess the independent associations between operative approach and outcomes

RESULTS

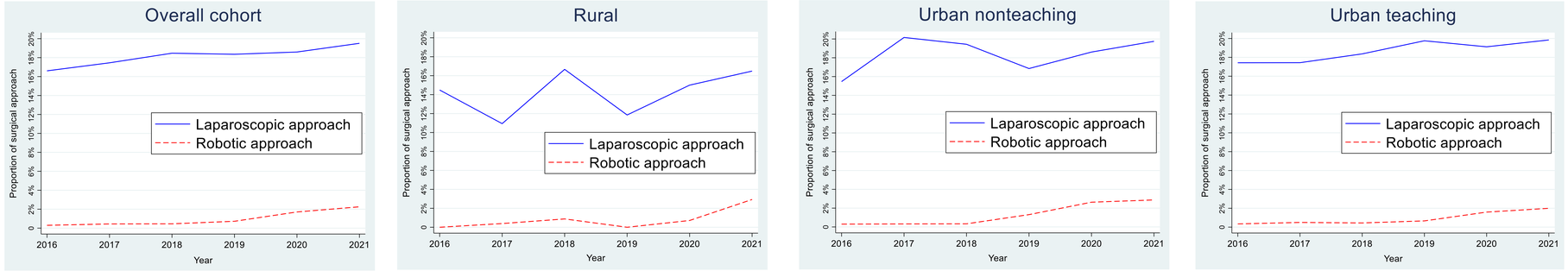


Figure. **Practice trend of surgical approach for PPU repair**

- A total of 78,350 patients underwent surgical repair for PPUs during the study period.
- Of those, 63,275 (80.8%) via an open approach, 14,275 (18.2%) laparoscopic, and 800 (1.0%) robotic.
- While the proportion of laparoscopic repairs was highest in urban teaching hospitals, the APC for the laparoscopic approach was highest in rural hospitals (APC = 4.0%).
- The APC for the robotic approach was highest in rural hospitals (APC=91.1%; 95%CI, 57.4% to 137.5%), followed by urban non-teaching (APC=70.9%) and urban teaching hospitals (APC=50.1%).

Table 1. **Multivariable logistic regression analysis for mortality and complications**

	Laparoscopic approach			Robotic approach		
Outcome*	AOR†	95% CI	p value	AOR†	95% CI	p value
In-hospital Mortality	0.60	(0.50-0.72)	<.001	0.22	(0.08-0.64)	0.005
Complication						
Pulmonary complication	0.59	(0.52-0.66)	<.001	0.68	(0.44-1.04)	0.074
Cardiac complication	0.72	(0.61-0.83)	<.001	1.23	(0.74-2.04)	0.426
Surgical Site Infection	0.37	(0.26-0.53)	<.001	0.55	(0.17-1.77)	0.314
Venous thromboembolism	0.69	(0.51-0.94)	0.017	0.66	(0.20-2.12)	0.480
Paralytic ileus	0.74	(0.62-0.88)	0.001	0.80	(0.43-1.49)	0.482

Table 2. **Multivariable linear regression analysis for hospital length of stay and hospital charges**

	Laparoscopic approach			Robotic approach		
Outcome*	RC†	95% CI	p value	RC†	95% CI	p value
Log_{10} **(Length of stay)**	-0.089 (-18.5%)	-0.100 – -0.078 (-20.5% – -16.3%)	<.001	-0.092 (-19.1%)	-0.135 – -0.049 (-26.7% – -10.6%)	<.001
Log_{10} **(Hospital charges)**	-0.070 (-14.8%)	-0.083 – -0.056 (-17.4% – -12.2%)	<.001	+ 0.054 (13.3%)	0.00028 – 0.108 (0.06% – 28.3%)	0.049

* Reference group for all comparisons is patients with **open approach**.

CONCLUSIONS

- Despite its documented benefits, the adoption of laparoscopic repair for PPU has been slow, with open repair remaining the predominant surgical approach.
- Robotic repair, though still relatively rare, has increased rapidly, particularly in rural hospitals, and may offer improved outcomes compared to open surgery.
- The utility and cost/benefit ratio of robotic platforms should be reevaluated in future studies.