Increasing Utilization of Robotic Surgery for Gastrointestinal Surgical Operations at Academic Medical Centers

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Introduction

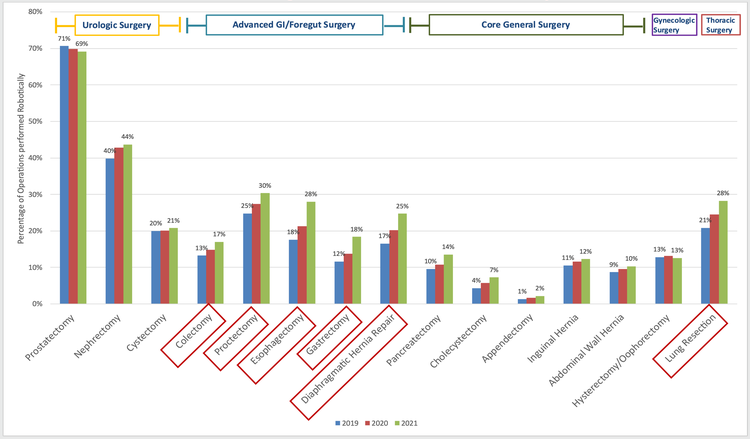
Robotic surgery has been increasing in utilization and adoption across various specialties and operations. While the robotic approach has been well established and heavily utilized in minimally invasive urologic surgery, general surgery and advanced gastrointestinal procedures have had lower utilization rates. This study seeks to ascertain the growth in robotic surgery for gastrointestinal surgical operations across national academic medical centers.

- Robotic surgery is increasing in utilization and scope of operations
  - US (2017): 644,000 cases
  - Gynecology: 252,000; General Surgery: 246,000; Urology: 118,000
- Initial utilization most prominent in minimally invasive urologic surgery, gynecologic surgery, and inguinal hernia repair (29%)
- However, where is the growth occurring now?

Methods and Procedures

- **Hypothesis**: Gastrointestinal surgical operations are driving the growth of robotic surgery in the present scope of surgical practice.
- Utilized the Vizient database consisting of all academic centers in the United States
- Drawback: all cases required an inpatient stay, therefore abdominal wall surgeries and gynecologic operations were sparsely included
- Total of 1.8 million surgical procedures included in the data set (2019 through 2021)
- 380,000 robotic procedures
- Dataset captured 356,000 of 380,000 total robotic surgeries; 94% of all cases
- **Urologic**: prostatectomy, nephrectomy, cystectomy
- **Gynecologic**: hysterectomy, salpingo-oophorectomy
- **General Surgical**: colectomy, proctectomy, esophagectomy, gastrectomy, diaphragmatic hernia repair, cholecystectomy, pancreatectomy
- **Thoracic Surgical**: lung resection

Percentage of Cases Performed Robotically

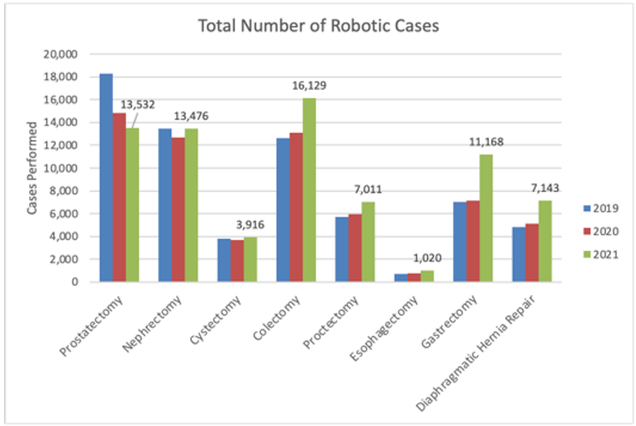


Results

Robotic surgery cases have been increasing overall from 122,000 cases in 2019 to 138,000 cases in 2021. The greatest increase in adoption has come through advanced gastrointestinal operations.

- Urology has the highest utilization rates, but adoption has plateaued
- Gynecology has similarly remained steady
- Greatest growth in utilization comes amongst general surgeons, specifically with advanced gastrointestinal procedures
  - Colectomy, Proctectomy, Gastrectomies, Diaphragmatic Hernia repairs, and Esophagectomies (11,600 new cases, 105% of total growth, or 35% of all cases)
  - **Foregut surgery**: 60% of growth
  - **Colorectal surgery**: 43% of growth
    - Percentage of robotic colectomies increased from 13% in 2019 to 17% in 2021, proctectomies from 25% to 30%
- Colectomy/Proctectomy is now the most commonly performed robotic surgery at US academic centers (23,000 cases in 2021)
- Thoracic surgery also exhibited a significant rise (11,000 cases; 9% of all cases); robotic lung resections increased from 21% to 28%

Results



Urology (control) vs Advanced GI Surgery

While absolute numbers of urologic surgery cases have plateaued, Advanced Gastrointestinal Surgery cases have increased

Year-over-year growth rate

Growth rate >20%

* Significant p <0.001

Case	2019 Percentage (actual)	2021 Percentage (actual)	Net Percent Change	Growth Rate
Prostatectomy	71% (18k)	69% (20k)	-1.5%*	-2.1%
Nephrectomy	40% (13k)	44% (13k)	+3.8%*	+10%
Cystectomy	20% (4k)	21% (4k)	+0.7%	+3.7%
Colectomy	13% (13k)	17% (16k)	+3.7%*	+28%
Proctectomy	25% (5.7k)	30% (7k)	**+5.6%***	+22%
Esophagectomy	18% (700)	28% (1k)	**+10.4%***	+59%
Gastrectomy	12% (7k)	18% (11k)	**+6.7%***	+59%
Diaphragmatic Hernia Repair	17% (5k)	25% (7k)	**+8.2%***	+50%
Pancreatectomy	10% (1.3k)	14% (1.9k)	+4%*	+41%
Cholecystectomy	4% (4k)	7% (7k)	+3%*	+69%
Abdominal Wall Hernia	9% (5.7k)	10% (6.3k)	+2%*	+19%
Hysterectomy/Oophorectomy	13% (8k)	13% (7k)	-0.2%	-2%
Lung Resection	21% (8k)	28% (11k)	**+7.4%***	+36%

2 Year growth rate (2021 vs 2019)

Statistically significant increase in nearly all procedures.

Growth rate >20% for Colectomy, Proctectomy, Esophagectomy, Gastrectomy, Diaphragmatic Hernia Repair, Pancreatectomy, Cholecystectomy, and Lung Resections

Conclusions

Urologic surgical procedures maintain the highest utilization rates of robotic surgery; however, the adoption rate has plateaued. The greatest growth in robotic surgery utilization has come amongst general surgeons, specifically with advanced gastrointestinal procedures. Thoracic surgeons have also demonstrated increased utilization with pulmonary resections and diaphragmatic hernia repairs

- Growth is as much medical as it is operational
- Considering market demands
- The two-year growth rate is significant
- General Surgeons, Advanced Gastrointestinal Surgeons, and Thoracic Surgeons are driving the increase in robotic surgery adoption at academic medical centers
- The value proposition remains equivocal
- Yet, in actual practice – academic General Surgeons are finding value in transitioning their cases to robotic-assisted surgery

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