Geographic and Facility Variations in Operative Approaches for Colorectal Cancer

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Introduction

Colorectal cancer (CRC) is one of the most common cancers diagnosed worldwide, accounting for roughly 10% of cancer diagnoses and cancer-related deaths.

Surgical resection plus or minus adjuvant therapy is still a cornerstone for Stage I-III disease.

The introduction of laparoscopic surgery (LS) has brought significant benefits, such as faster recovery time, less postoperative pain, and shorter length of stay while preserving oncologic outcomes.

Robotic-assisted surgery (RAS) now carries evidence to suggest a greater advantage to patients compared to LS with decreased blood loss and open conversion rates.

However, differences in the adoption of RAS in colorectal cancer in a variety of geographic and facility settings are not well described.

We aim to evaluate the discrepancies in RAS in the management of colorectal cancer in rural versus urban, and academic vs community settings in order to assess if these differences affect patient outcomes.

Methods and Analysis

Retrospective review of National Cancer Database (NCDB) of pt diagnosed with CRC and underwent surgical resection between 2010-2022.

Geographical Designations:
- Rural : population ≤ 2,500 people +/- adjacent to metro area
- Urban: 2,500 – 20,000+ +/- adjacent to metro area
- Metro: population 250,000 – 1 Million or more

Facility Designations:
- Community: single or comprehensive community cancer program
- Academic: Academic/Research Center or integrated network cancer program

Surgical Approaches:
- Robotic Assisted Surgery (RAS) vs Laparoscopic vs Open

End Points:
- Rates of adaptation of RAS and Laparoscopic surgery
- Conversion to Open Surgery
- 90-Day Mortality

Year	Rural (%)	Metro (%)	Community (%)	Academic (%)
2010	1.5	1.2	1.0	1.5
2011	2.2	1.9	1.9	1.9
2012	2.9	2.5	2.6	2.5
2013	3.3	3.3	3.2	3.4
2014	3.9	4.9	4.7	4.9
2015	5.5	6.8	6.1	7.3
2016	8.5	9.1	8.7	9.6
2017	10.6	11.7	10.8	12.4
2018	17.5	15.6	13.6	17.8
2019	17.7	18.7	18.2	19.2
2020	20.5	21.4	20.1	22.3
2021	26.0	24.5	23.8	25.2
2022	29.6	28.8	28.0	29.9

Table 1: Rate of Robotic Colectomy Adaptation by Geography and Facility

Geographic Distinction	1 yr	2 yr	5 yr	10 yr	P-value
Rural	0.960	0.906	0.648	0.257	0.5
Metro	0.963	0.912	0.658	0.256	

Survival rates after CRC resection compared by Geographic Distinction (*Table 2, above*) and Facility Designation (*Table 3, below*)

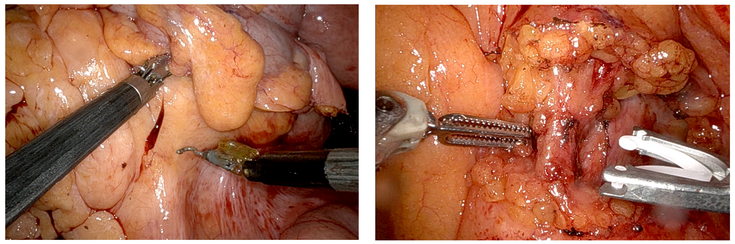
Facility Designation	1 yr	2 yr	5 yr	10 yr	P-value
Community	0.978	0.937	0.709	0.292	< 0.001
Academic	0.980	0.929	0.667	0.261	

Conversion to open and 90-Day Mortality Rates compared by Geography ***(Table 4, left)*** and Facility Designation ***(Table 5, right)***

	Rural	Metro	P-value
n = 165428	n = 11701	n = 153727	
Lap to open conversion	675 (13.6)	8493 (12.1)	0.002
Robotic to open conversion	74 (6.1)	936 (6.2)	0.924
30-day mortality	382 (3.5)	5278 (3.6)	0.428
90-day mortality	721 (6.6)	10063 (7.0)	0.168

	Community	Academic	P-value
n = 161228	84344	76884	
Lap to open conversion	4829 (12.8)	4119 (11.6)	<0.001
Robotic to open conversion	499 (6.6)	496 (5.9)	0.061
30-day mortality	3309 (4.1)	2313 (3.2)	< 0.001
90-day mortality	6194 (7.8)	4495 (6.2)	< 0.001

Image 1 (left) Robotic Medial to Lateral Dissection. ***Image 2 (Right)*** Dissection and Clipping on IMA. Both images are intraoperative images taken at Vassar Brothers Medical Center, Poughkeepsie, NY.



Results

There was no statistically significant difference in 90-day mortality in rural(6.6%) vs urban centers (7.0%).

Patients undergoing surgical resection had a higher 90-day mortality in community facilities (7.8%) compared to academic centers (7.0%).

There was no difference in robotic to open conversion rates.

There were noted higher rates of laparoscopic to open conversion rates at community and rural centers.

Additionally, RAS has been increasingly utilized in all settings, with a faster rate of adoption in academic facilities when compared to community settings, regardless of its location in a metro versus rural setting.

Conclusions

Variations exist in operative approaches for CRC when comparing rural vs urban and community vs academic centers.

The choice for patients to receive CRC resection based on their geographic preference, regardless of urban or rural settings, does ***not*** affect their 90-mortality from surgery.

Robotic Assisted CRC Surgery is being utilized at an increasing rate each year, in most cases replacing complex laparoscopy. In both rural and urban settings, RAS is being adopted faster at academic facilities compared to community settings.

There was ***no difference in rates of RAS conversion to open*** regardless of geographic and facility location and capabilities, however there were ***higher rates of laparoscopic to open conversion rates at rural, community hospitals***.