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The effect of hospital familiarity with complex procedures on overall healthcare burden

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Abstract

Background: This study aimed to evaluate variations in prolonged outcome after proctectomy based on hospital volume.

Study design: From the Premier Perspective database (2012–2014), hospital volumes for proctectomy of benign and malignant conditions were classified as low, intermediate and high. Hospitals were grouped into tertiles. Impact of procedure volume on in-hospital as well as 90-day post-discharge complications, length of stay, discharge destination and costs was evaluated.

Results: Of 9306 proctectomy procedures, 6960 occurred at high, 1695 at intermediate and 651 at low volume hospitals. After adjustment, high volume institutions were associated with lower in-hospital surgical complications while low volume centers had higher ninety-day post-discharge medical and surgical complications ($p < .05$ for all). High volume centers had a shorter hospital stay while the need for extended care facility was higher in low volume centers ($p < .05$ for all). Healthcare costs were higher for low volume hospitals.

Conclusion: These data suggest that variations in outcomes and costs after complex procedures such as proctectomy exist and are related to institutional familiarity with a procedure.

1. Introduction

Hospital and surgeon may determine patient outcomes particularly after complex operations. An increased experience with the procedure, level of training, treatment supervision, the nuances of management of the condition and adherence to guidelines are expected at a high volume institution.[1–5] The volume-outcome relationship has been shown to be important in coronary artery bypass graft, breast cancer, bladder cancer as well as major colorectal resections and most crucially in high-risk and rarely performed operations.[6–10] While better outcomes at a high volume center have been attributed to superior intraoperative and postoperative levels of care,[11] detailed clinical, financial, and quality-based implications of care based on where surgery for a complex procedure is performed have not been studied. In particular, such implications in the extended period after discharge, rather than with in-hospital care alone, have not been evaluated.

Within the field of colorectal surgery, rectal resection is technically challenging requiring surgical precision for clearance while preserving sexual and urinary function.[12,13] Rectal cancer has a relatively worse 5-year survival than other lower gastrointestinal malignant tumors, perhaps explained by these greater operative and clinical demands in management.[14] Rectal resection performed at high volume and/or a comprehensive cancer center by a board-certified colorectal surgeon has been reported to be associated with better overall survival[15] and in low volume hospitals reported to have high circumferential margin involvement rates[16] although such data may be related to variations in adherence to rectal cancer management guidelines.[17] Most of published data on the volume-outcome relationship relate to mortality, long-term survival and oncological outcomes of rectal cancer.[10,15–18] Such an approach may underestimate other rectal conditions and essential quality parameters, including procedure-related complications, discharge destination and post-discharge adverse events. Further, no previous study has evaluated the clinical and financial impact of institutional volume over a prolonged duration (until 3 months) after surgery. This study aimed to evaluate variations in prolonged

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outcome after proctectomy of benign and malignant diseases based on hospital volume.

2. Methods

Patients undergoing rectal resection procedures were identified from a large inpatient database. Premier Perspective is a Health Insurance Portability and Accountability Acts (HIPAA) compliant administrative database, which contains all in-hospital billing records for every admission in participating institutions, such as diagnostic investigations, medications, use of specific operative procedures and other treatment modalities. Patient coding history, healthcare costs and hospital-level information are also documented in this representative database and have been utilized by a number of healthcare quality and comparative effectiveness publications.[19–25] The database has been developed and maintained by Premier Inc (Charlotte, North Carolina) to provide quality assured and validated patient-level data with 95 separate checks, from approximately 500 acute-care hospitals. The Premier Perspective Claims Database (PCD) is a large, service-level, all-payer (including Medicaid, Medicare, and commercial) comparative database, containing information on approximately five million annual hospital discharges (approximately one fifth of all acute care hospitalizations in the United States) from primarily non-profit, non-governmental, community and teaching hospitals, and health systems. A non-human subject review exemption from the Institutional Board Review (IRB) committee at Columbia University Medical Center was obtained prior to conducting research.

Patients ≥18 years of age who underwent a primary proctectomy procedure between February 2012 to September 2014, were identified. Given the aim of this study was to evaluate proctectomy-related outcomes, we chose the criteria to be as inclusive as possible using the procedural *International Classification of Diseases, Ninth Edition, Clinical Modification (ICD-9-CM)* codes for abdominoperineal resection (48.51, 48.52), anterior resection (48.62, 48.63), posterior resection (48.64), pull-through resection of rectum (48.42, 48.43), total proctocolectomy (if: 45.81 and 48.63 or 48.51 or 48.42 or 48.64 or 48.61 or 48.65 or 48.69 or 45.95, or if: 45.82, 48.63 or 48.52 or 48.43 or 48.64 or 48.61 or 48.65 or 48.69 or 45.95) as well as other rectal resection procedures (48.61, 48.65,

Table 1
Patient characteristics stratified by proctectomy hospital volume.

Variable	Low volume hospitals N = 651	Intermediate volume hospitals N = 1695	High volume hospitals N = 6960	p-value
Age, n (%)				
18 to 24 years old	1 (0.2)	3 (0.2)	32 (0.5)	.1
25 to 34 years old	5 (0.8)	16 (0.9)	155 (2.2)	<.001
35 to 44 years old	35 (5.4)	77 (4.5)	473 (6.8)	.002
45 to 54 years old	120 (18.4)	335 (19.8)	1392 (20)	.6
55 to 64 years old	163 (25)	394 (23.2)	1798 (25.8)	.1
65 to 74 years old	156 (24)	474 (28)	1746 (25.1)	.03
Over 74 years old	171 (26.3)	396 (23.4)	1364 (19.6)	<.001
Gender, n (%)				
Male	339 (52.1)	864 (51)	3574 (51.4)	.9
Female	312 (47.9)	831 (49)	3386 (48.7)	.9
Race, n (%)				
White	483 (74.2)	1327 (78.3)	5267 (75.7)	.04
African American	67 (10.3)	106 (6.3)	441 (6.3)	<.001
Other	101 (15.5)	262 (15.5)	1252 (18)	.02
Insurance type, n (%)				
Government	399 (61.3)	993 (58.6)	3530 (50.7)	<.001
Managed care	184 (28.3)	521 (30.7)	2539 (36.5)	<.001
Other	68 (10.5)	181 (10.7)	891 (12.8)	.02
APR-DRG severity score, n (%)				
Minor	224 (34.4)	628 (37.1)	2784 (40)	.003
Moderate	263 (40.4)	651 (38.4)	2770 (39.8)	.5
Major	128 (19.7)	317 (18.7)	1090 (15.7)	.001
Extreme	32 (4.9)	81 (4.8)	273 (3.9)	.2
Unknown	4 (0.6)	18 (1.1)	43 (0.6)	.1
Co-morbidities, n (%)				
Cardiovascular	340 (52.2)	904 (53.3)	3410 (49)	.003
Peripheral vascular	22 (3.4)	65 (3.8)	185 (2.7)	.03
Hematological	159 (24.4)	335 (19.8)	1091 (15.7)	<.001
Pulmonary	114 (17.5)	302 (17.8)	1121(16.1)	.2
Endocrine	159 (24.4)	433 (25.6)	1643 (23.6)	.2
Renal	42 (6.5)	84 (5)	290 (4.2)	.01
Neurological	24 (3.7)	58 (3.4)	235 (3.4)	.9
Liver or Gastrointestinal	13 (2.00)	29 (1.7)	130 (1.9)	.9
Musculoskeletal	14 (2.2)	46 (2.7)	148 (2.1)	.3
Immunodeficiency	0 (0.0)	3 (0.2)	7 (0.1)	.5
Malignancy	486 (74.7)	1227 (72.4)	4472 (64.3)	<.001
Obesity	85 (13.1)	210 (12.4)	812 (11.7)	.5
Weight loss	49 (7.5)	95 (5.6)	410 (5.9)	.2
Psychiatric	87 (13.4)	188 (11.1)	658 (9.5)	.002
Fluid Electrolytes	129 (19.8)	313 (18.5)	1128 (16.2)	.01
Other	25 (3.8)	35 (2.1)	187 (2.7)	.05
Admission type				
Elective	523 (80.3)	1418 (83.7)	5785 (83.1)	.1
Emergency	89 (13.7)	175 (10.3)	499 (7.2)	<.001
Urgent	35 (5.4)	80 (4.7)	658 (9.5)	<.001
Other	4 (0.6)	22 (1.3)	18 (0.3)	<.001

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