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Impact of hospital volume on quality indicators for rectal cancer surgery in British Columbia, Canada

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Abstract

BACKGROUND: The relationship between hospital volume and patient outcomes remains controversial for rectal cancer.

METHODS: This is a population-based database study. Patients treated with surgery for a stage I to III rectal adenocarcinoma from 2003 to 2009 were identified. High-volume hospitals (HVH) were those centers performing 20 surgeries or more per year. Primary outcomes were operative and perioperative factors that have proven influence on patient outcomes.

RESULTS: In all, 2,081 patients had surgery for rectal cancer. Of these, 1,690 patients had surgery in an HVH and 391 had surgery in a low-volume hospital. On multivariate analysis, patients who had surgery in an HVH were more likely to have sphincter-preserving surgery, 12 or more lymph nodes removed with the tumor, neoadjuvant radiation therapy, and receive pre-operative or postoperative chemotherapy.

CONCLUSIONS: For rectal cancer patients in British Columbia, Canada, being treated at an HVH is associated with several quality indicators linked to better patient outcomes.

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The relationship between hospital volume and patient outcomes is well established for certain cancer types including esophageal and pancreatic.[1,2] However, it remains controversial whether this relationship exists in patients treated for rectal cancer. Several studies, including recent meta-analyses, have demonstrated improved outcomes for patients with rectal cancer who are treated at high-volume hospitals (HVH).[3–6] Conversely, some studies have shown

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equivalent outcomes in rectal cancer surgical care in patients treated at HVHs and low-volume hospitals (LVH).[7,8]

Health care planners and policy makers rely on health outcomes research to guide decision making. The relationship between provider volume and outcome has led to centralization of many surgical procedures.[9,10] However, such a policy creates a burden for patients who must travel to HVHs for care, often against their preference to have treatment in a local hospital.[11] Encouraging centralized care can only be justified if data support substantial benefit from referral to HVHs.

In volume–outcomes research, the primary outcomes most commonly studied have included postoperative mortality, local recurrence, and overall survival. These end points are easily obtained from population databases. However, these outcomes can be influenced by use of radiotherapy, chemotherapy, and variable diligence in follow-up to identify and treat recurrences. For rectal cancer, studies have rarely examined the association between hospital volume and quality indicators that have been shown to be important to clinical, quality of life, or oncologic outcomes.[3,12–14]

The purpose of this study was to determine if surgery in high-volume rectal cancer surgery centers are associated with quality indicators known to influence oncologic or quality-of-life outcomes in a Canadian population-based setting.

Methods

Databases

In British Columbia (BC), cancer is a reportable disease, and all cancers diagnosed in BC residents are reported to the British Columbia Cancer Registry. Since 2002, the BC Cancer Agency (BCCA) Gastrointestinal Cancer Outcomes Unit (GICOU) has collected patient, tumor, treatment, and outcomes data in all patients referred for evaluation and/or care by medical and radiation oncologists. Furthermore, the BCCA maintains an extract of the Discharge Abstract Database (DAD) from the BC Ministry of Health for all BC residents with a diagnosis of cancer coded as the most responsible primary or secondary diagnosis for admission to hospital. These data include diagnostic, comorbidity, procedural, and hospitalization data for all patients admitted to hospital from 1992 to 2012.[15] These data are collected at each hospital in BC by expert data abstractors and are categorized using *International Classification of Diseases*, Ninth Revision and Tenth Revision standards.

This study has been approved by the Providence Health Care Research Ethics Board of the University of British Columbia.

Study design

From January 2003 to December 2009, all patients 18 years or older treated with surgery for stage I to III rectal adenocarcinoma were identified in the GICOU database. Patients with concurrent malignancies in multiple organs and synchronous primaries were excluded.

We performed a deterministic linkage with the BCCA DAD database using personal health number and date of birth. Relevant demographic, pathologic, treatment, and outcome data were collated.

In the literature, hospital volume is typically classified based on the number of primary surgeries for rectal cancer per annum. A recent meta-analysis of 7 studies comparing outcomes in rectal cancer in HVHs vs LVHs demonstrated a range of HVH designation between 17 and 35 resections per year.[5] In our data, HVHs were defined as those centers performing 20 or more rectal cancer surgeries per year based on this literature (Fig. 1).

Outcomes

The primary outcomes of interest in this study were operative and perioperative factors that have proved influence on clinical, oncologic, or quality-of-life outcomes. These include neoadjuvant radiation therapy,[16,17] sphincter preserving surgery, lymph node harvest 12 or more nodes,[18,19] and preoperative or postoperative chemotherapy administration. A secondary outcome was patient overall survival.

Statistical analysis

The chi-square tests of independence were used to test for the association between hospital volume and categorical demographic and quality indicators. The Wilcoxon ranked-sum test was used to test for differences in age distribution between patients who went to HVH and LVH. Logistic regression was used to determine which demographic and quality variables were associated with hospital volume. Odds ratios were obtained to quantify the association between hospital volume and each predictor. Cox proportional hazards regression was used to test for any difference in overall survival between cases treated in HVH and LVH while controlling for other covariates. Hazard ratios were obtained to quantify the association between overall

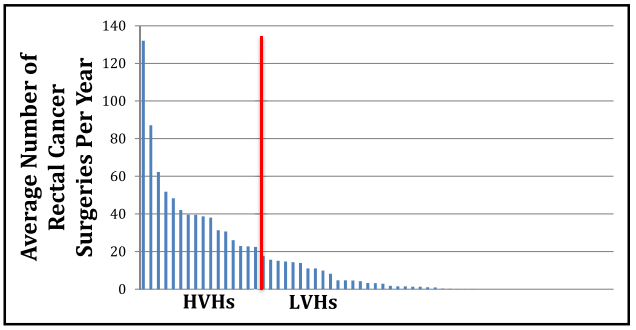

Figure 1 Annual volume of rectal cancer surgery at 45 hospitals in BC.

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