The Importance of Surgeon Characteristics on Impacting Oncologic Outcomes for Patients Undergoing Radical Cystectomy

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Abbreviations and Acronyms

AC = adjuvant chemotherapy

BC = bladder cancer

BCSS = bladder cancer specific survival

MDBCC = multidisciplinary bladder cancer clinic

NAC = neoadjuvant chemotherapy

OS = overall survival

RC = radical cystectomy

RFS = recurrence-free survival

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Purpose: Given that the urologist has a major influence on outcomes of radical cystectomy, it is of interest to patients, trainees, urologists and administrators to understand the provider characteristics associated with favorable outcomes. Therefore, we assessed associations between various surgeon characteristics and long-term oncologic outcomes for patients undergoing radical cystectomy for bladder cancer.

Materials and Methods: A retrospective cohort treated with radical cystectomy for muscle invasive or nonmuscle invasive bladder cancer at University Health Network (Toronto) was assembled. The characteristics studied included years of experience in independent practice, surgical radical cystectomy volume, subspecialized focus in bladder cancer and uro-oncology fellowship training. The outcomes were overall survival, bladder cancer specific survival and recurrence-free survival. Kaplan-Meier analyses and multivariate Cox proportional hazards models adjusting for patient, tumor and treatment related parameters were used.

Results: The final cohort included 410 patients treated by 11 urologists (median followup 57 months). Bladder cancer focused and uro-oncology fellowship trained urologists performed more extensive lymphadenectomies and more often performed continent diversions, but there was no difference in the use of neoadjuvant chemotherapy. In Kaplan-Meier and univariate Cox analyses, subspecialized bladder cancer focus and uro-oncology fellowship were associated with improved survival outcomes. However, in multivariate Cox models only subspecialized bladder cancer focus was independently associated with improved overall survival (HR 0.68, 95% CI 0.55–0.85, $p < 0.001$), bladder cancer specific survival (HR 0.63, 95% CI 0.41–0.96, $p = 0.032$) and recurrence-free survival (HR 0.63, 95% CI 0.42–0.95, $p = 0.027$).

Conclusions: While radical cystectomy volume, experience and uro-oncology fellowship are all likely important, we found that subspecialized focus in bladder cancer was independently associated with improved long-term oncologic outcomes. Our data support disease site differentiation among uro-oncologists at large institutions.

Key Words: cystectomy, mortality, patient outcome assessment, urinary bladder neoplasms

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RADICAL cystectomy with lymphadenectomy has a central role in the management of muscle invasive bladder cancer and high risk nonmuscle invasive bladder cancer.[1–3] As such, the treating urologist is an important factor that warrants attention. Studies evaluating the association between surgeon volume of RC and in-hospital mortality and long-term oncologic outcomes have suggested that there is a difference in the quality of care provided by low volume vs high volume surgeons[4–7] and low volume vs high volume hospitals.[6–9] However, reasons for these differences have not been fully elucidated. The causal link remains to be confirmed since reverse causality is equally plausible. In other words, it is unclear whether high surgical volume improves surgical ability through repetition and experience, or whether surgical ability attracts more referrals and, thus, results in high surgical volume.

The literature supports that the extent of lymphadenectomy and surgical margins[10,11] as well as the decision to use neoadjuvant[12,13] or adjuvant chemotherapy[14] influence oncologic outcomes. However, the heterogeneity in outcomes among surgeons likely extends beyond the decisions made relating to these factors. Our hypothesis is that there are additional surgeon characteristics, beyond those already established, that influence oncologic outcomes. We determined whether specific surgeon characteristics are associated with long-term survival outcomes independent of patient and tumor characteristics and treatment related factors.

METHODS

Patients and Data Sources

Patients who underwent RC between January 1988 and December 2012 at Toronto General and Mount Sinai Hospitals in Toronto were identified retrospectively using our institutional database. Patients with muscle invasive BC, T1 high grade disease, refractory carcinoma in situ and uncontrolled Ta disease who underwent RC as primary treatment with curative intent were included in the analysis. Patients were excluded from the study if RC was performed for palliation in the context of metastatic disease (3), salvage after failed chemoradiation bladder sparing therapy (20) or partial cystectomy (1), consolidation following response to primary chemotherapy (12), invasive prostatic urothelial carcinoma (5), non-urothelial histology such as adenocarcinoma or sarcoma (7), concomitant management of BC and prostate cancer (2) or distal ureteral urothelial carcinoma (2), intractable hematuria (3), malignant colovesical fistula (1), or persistent positive cytology without visible lesion (1). Lastly, since our objective was to study long-term survival outcomes, we also excluded patients with in-hospital perioperative mortality (7), defined as mortality within 30 days, as the influence of surgeon volume on short-term mortality has been established in the literature.[5,7,8] Inclusion of this last group of patients in preliminary analyses resulted in models that violated the proportional hazards assumption. In addition, the number of perioperative events was insufficient to analyze them separately.

Clinical parameters were ascertained using electronic chart review. Mortality data (including cause of death) were obtained through the Princess Margaret Hospital Cancer Registry and were supplemented by chart review. Institutional research-ethics board approval was obtained.

Primary Study Exposures

Four surgeon characteristics were studied. Clinical interest was defined dichotomously as whether the urologist has a subspecialized clinical practice and research focus in BC. Similar to some other high volume centers, urologists at our institution have a subspecialized focus in certain disease sites. Urologists with an interest in BC participate in our institutional MDBCC, which was initiated in 2008. This clinic functions in a multidisciplinary manner with uro-oncologists and radiation oncologists seeing patients simultaneously to assess optimal local treatment. Urologists classified as subspecialized BC focused surgeons also had a subspecialized clinical practice focus in BC before the establishment of the MDBCC. No other surgeons were considered to have had a subspecialized focus in BC before 2008. Thus, it was believed that participation in the MDBCC optimally identified surgeons with a subspecialized focus in BC.

The next characteristic studied was overall surgeon experience, which was defined based on years of experience in independent practice at the time of RC. This value was calculated as the difference in years between the date of RC and the date of entry into practice of the operating urologist.

Surgeon volume was defined as the number of RCs performed by the urologist in the year preceding the index RC. Defining experience and volume in this manner allowed both to vary across the study period for each surgeon. Lastly, urological oncology fellowship training (clinical and/or research based) was defined dichotomously.

Outcomes Measures

The primary outcome was overall survival. The secondary outcomes were BC specific survival and recurrence-free survival. These outcomes were measured in months from the date of the first treatment (RC or NAC).

Statistical Analysis

Statistical analyses were performed using SAS® v9.3. Clinical characteristics were compared between strata of each surgeon characteristic (above and below median for surgeon experience and volume) using the Wilcoxon rank sum test, Pearson's chi-square test and Fisher's exact test. Kaplan-Meier analyses with log rank tests were used to compare survival outcomes between strata of surgeon characteristics.

Univariate and multivariate Cox proportional hazards models were built for each survival outcome. To assess the independent effect of each surgeon characteristic, the multivariate models included all 4 surgeon characteristics along with a priori selected patient related risk factors (baseline age, gender, Charlson comorbidity index), tumor related variables (pathological T stage and N stage) and