



## Original Article

# Health care services utilization during the last 6 months of life among patients with bladder cancer who underwent radical cystectomy in Quebec, Canada

Ahmed S. Zakaria, M.D., M.Sc.<sup>a</sup>, Fabiano Santos, Ph.D.<sup>b</sup>, Alice Dragomir, Ph.D.<sup>a</sup>,  
Wassim Kassouf, M.D., F.R.C.S.C.<sup>a</sup>, Simon Tanguay, M.D., F.R.C.S.C.<sup>a</sup>,  
Armen Aprikian, M.D., F.R.C.S.C.<sup>a,\*</sup>

<sup>a</sup> Department of Surgery, Division of Urology, McGill University, Montreal, Canada

<sup>b</sup> Division of Cancer Epidemiology, McGill University, Montreal, Quebec, Canada

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## Abstract

**Introduction and objectives:** Management of bladder cancer imposes a great economic challenge on the health care system; with the greatest share of this burden attributed to radical cystectomy (RC) and prolonged postoperative follow-up. Our aim was to characterize health care services utilization and evaluate associated cost predictors during the last 6 months of life in patients who had RC.

**Methods:** We conducted a retrospective study within a cohort of 2,988 patients who had RC from 2000 to 2009. Data were obtained from the Quebec health insurance medical services database. We included patients who deceased during the study period, and survived at least 6 months after the first 90 postoperative days. Services billing codes were used to retrieve hospital, outpatient and imaging services. Linear regression models were used to assess predictors of costs.

**Results:** From the 1,355 patients who deceased during the study period, we analyzed data of 799 subjects. Men formed 77.3% and 52.8% of patients were between 60 and 75 years of age at the time of RC. In their last 6 months of life, 17.2% of patients had surgery for major urinary tract complications, 25% had chemotherapy whereas 27.6% had radiotherapy. Also, 3.5% of patients had hemodialysis. Imaging was performed in 94.6% of patients. Urologist (specialist) visits ranked first where 72.3% of patients had 3,481 visits (average = 6 visits/pt) followed by medical subspecialist where 69% of patients had 10,010 visits (average = 18 visits/pt). For supportive care, 97% of patients had 25,560 family physician visits (average = 31 visits/pt) whereas only 16% of them had highly specialized care. Services utilization kept increasing with time especially during the last 2 months before death. Post-RC complications were significant predictor associated with increased costs at all assessed services ( $P < 0.0001$ ).

**Conclusion:** Our study results suggest that health care services utilization varies in the assessed period. Urologists involvement in the process of care tends to decrease over time, in favor of other medical specialties, however, some health care services, such as highly specialized supportive care, may be underutilized. © 2017 Elsevier Inc. All rights reserved.

**Keywords:** Bladder cancer; Radical cystectomy; Health services utilization; Quebec

## 1. Introduction

Urinary bladder cancer (BC) is a common disease worldwide, ranking 11th in worldwide cancer incidence [1]. In North America, BC is the second most common genitourinary tract tumor [2,3] and in 2015, Quebec ranked first among all Canadian provinces regarding incidence with an estimated 2,750 new cases and ranked second in terms of mortality with an estimated 580 deaths [4].

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\* Corresponding author.

E-mail address: armen.aprikian@muhc.mcgill.ca (A. Aprikian).

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The vast majority of patients with BC present with non-muscle-invasive BC that might progress later on, whereas up to 25% of patients will present with invasive disease. Nevertheless, primary and progressive muscle invasive BC are often treated with radical cystectomy (RC) [5]. Of all cancers, BC is believed to be one of the most expensive to treat as it has the highest lifetime treatment costs per patient from diagnosis to death [6,7]. The expensive treatment costs, perioperative and postoperative complication management costs as well as the frequent intensive follow-up strategies are the key contributors to the economic challenge posed by this disease [8].

Owing to the demographic trends of aging, the management of patients with BC in the near future is expected to become an increasingly substantial economic burden. Literature review revealed scarcity of health economic and service utilization studies associated with BC care particularly in Canada, we previously reported 2 studies discussing this aspect in relation to RC [9,10]. In the current study, we aimed to characterize the health care services utilization in the last 6 months of life preceding death in patients who had RC and determine any predictive factors. Our main objective was to provide evidence-based data from the health care system perspective, and to generate descriptive evidence that can eventually serve as a basis for other hypothesis-testing studies.

## 2. Materials and methods

### 2.1. Data source and study design

Our study cohort was built retrospectively using data of patients who underwent RC for BC across Quebec province between January 1, 2000 and September 30, 2009. This was done, as previously described [11], by the linkage of the following 2 administrative databases: (1) The *Régie de l'assurance maladie du Québec* (RAMQ), which is the only organization responsible for the province's universal health system. All health care services dispensed to Quebec residents are recorded in the RAMQ administrative databases, which are composed of a set of claims files that provides information on medical services. This database provides collected data on physician-based diagnoses (International Classification of Diseases, ninth revision), relevant therapeutic procedures and its calendar date, characteristics of the patient, health care providers, and the costs involved. (2) The *Fichier des événements démographiques de l'Institut de la statistique du Québec* (ISQ), which provides information on all births and deaths in Quebec.

After obtaining approval from the *Commission de l'accès à l'information* (CAI) of Quebec, the provincial agency that grants authorization for the use of linked administrative databases, the 2 datasets were linked using patient anonymous identifier (generated from the *Numéro d'assurance*

*maladie*[NAM], which is a unique identifier for all legal residents of Quebec). Ethics approval was obtained from the research ethics board of the McGill University Health Centre.

We included patients who had RC for BC from January 1, 2000 until September 30, 2009, which were identified using standardized provincial procedure act codes, and also had all medical services data available for the 2-year period preceding RC. We excluded patients who had not lived at least 6 months beyond the first 90 day postoperative period in order not to contaminate our cohort with potential deaths due to surgical complications. The calendar date of RC (index date) is the date when each patient entered the cohort.

### 2.2. Health care services utilization assessment

Given the administrative nature of our dataset, we characterized health care services utilization at the following 3 levels: (1) *Hospital-based services*: surgeries to deal with urinary tract complications, gastrointestinal tract complications, tumor recurrences, chemotherapy, radiotherapy, and hemodialysis; (2) *Outpatient-based services*: consultations and visits with general practitioners, surgical and medical specialists, and subspecialists; and (3) *Imaging services*: X-ray, abdominopelvic ultrasound, abdominopelvic computed tomography (CT) scan, other body parts CT scan, bone scan, and magnetic resonance imaging.

### 2.3. Predictors of costs

Two groups of variables were considered as potential predictors of costs during the study period: (1) *Patient-related variables*: age at RC (4 categories: <60, 60–69, 70–75, and >75 years of age) and sex (dichotomous); and (2) *Health care services-related variables*: presence of postoperative complications in the first 90 days postoperative period (dichotomous), having RC in academic hospitals, defined as hospitals with an urology teaching program (dichotomous), hospitals' annual RC case load (3 categories: hospitals performing <10 RC/y, hospitals performing between 10 and 25 RC/y, and hospitals performing >25 RC/y), surgeons' annual RC case load (3 categories: surgeons performing <3 RC/y, surgeons performing between 3 and 9 RC/y, and surgeons performing 10 or more RC/y), and geoadministrative region where RC was performed (4 regions, grouped A–D). Geoadministrative division was defined by the Government of Quebec Ministry of Health and based on the Academic Integrated Network of Health that divides the province of Quebec into 4 regions according to provision of medical services and university affiliation [12].

### 2.4. Statistical analysis

Descriptive statistics were used to summarize the characteristics of the study population and for description of the

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