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Economic Burden Associated with Hospitalization for Radiation Cystitis: Results from a Statewide Inpatient Database

Jonathan E. Kiechle, Simon P. Kim,* James B. Yu, Matthew J. Maurice, Shan Dong, Edward E. Cherullo and Robert Abouassaly†

From the University Hospitals Case Medical Center, Case Western Reserve University School of Medicine, Urology Institute, Cleveland, Ohio (JEK, SPK, MJM, SD, EEC, RA), and Department of Therapeutic Radiology, Yale University, New Haven, Connecticut (JBY)

Abstract

Introduction: Radiation cystitis is associated with a significant burden to patients and the health care system. However, the regional burden of treatment and its associated costs remains poorly described. We assessed the health care costs and need for intervention among patients admitted to the hospital with radiation cystitis.

Methods: Using data from the Ohio Hospital Association we identified patients admitted with a diagnosis of radiation cystitis from 2009 to 2013. The primary outcome was the adjusted inpatient cost (adjusted to 2013 U.S. dollars) associated with in-hospital treatment of radiation cystitis. Secondary outcomes included percentage of patients requiring endoscopic urological procedures, blood transfusions and nephrostomy tubes. We used a generalized estimating equation model to determine in-hospital costs. Multivariate logistic regression analyses were used to determine factors associated with requiring an invasive procedure.

Results: We identified 1,111 patients admitted to Ohio hospitals between 2009 and 2013 with a diagnosis of radiation cystitis. Mean patient age (±SD) was 73.9 (±12.5) years. Median length of stay was 4 days (IQR 3−8). The adjusted median cost of hospitalization per admission in 2013 for these patients was $7,151 (IQR $4,251−$16,569). Overall 28.9% of patients required blood transfusions, 34.4% required endourological procedures and 3.4% required nephrostomy tubes. The odds of undergoing an invasive procedure were associated with increasing length of stay, need for blood transfusion and male gender.

Conclusions: This study is the first population based study to our knowledge to assess the treatment burden and health care costs from radiation cystitis. A diagnosis of radiation cystitis carries with it a significant economic and treatment associated burden.

Key Words: cystitis; radiation injuries; economics, medical

Abbreviations and Acronyms

LOS = length of stay

RC = radiation induced hemorrhagic cystitis

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† Correspondence: University Hospitals Case Medical Center, Case Western Reserve University School of Medicine, Urology Institute, 11100 Euclid Ave., Lakeside Building, Suite 4554, Mailstop LKS 5046, Cleveland, Ohio 44106 (FAX: 216-844-1900; *e-mail address:* Robert.abouassaly@uhhospitals.org).

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Clinical practice guidelines recommend external beam radiation or brachytherapy for the primary or adjuvant treatment of various abdominopelvic malignancies, including prostate, cervical, uterine and colon cancers.[1–4] Radiation induced hemorrhagic cystitis is a known complication of pelvic radiation that can first present years after initial radiation therapy.[5,6] The estimated incidence of RC is 5% to 10% after pelvic radiation.[6] Symptoms of RC range from microscopic hematuria to recurrent, recalcitrant gross hematuria with clots.[7] Due to the wide range of symptomatology and the failure of any conservative treatment to be 100% effective, a wide range of treatment options has been proposed, including oral or intravenous medications, intravesical irrigations, hyperbaric oxygen therapy, internal iliac embolization, endoscopic clot evacuation and fulguration and, in the most severe cases, cystectomy with urinary diversion.[8,9]

While many studies have been published evaluating novel treatment methods for RC, no population based studies have been published examining the large scale economic and treatment associated burden that accompanies a diagnosis of RC.[7,10] In the modern health care environment where economics and reimbursement have an increasingly important role in health care policy, it is imperative to have information about the economic impact that specific disease states have on the health care system. We believe that the inpatient treatment of radiation cystitis was likely associated with substantial economic cost and procedural burden to the health care system. To determine this burden we identified patients with radiation cystitis in Ohio and assessed the economic and procedural burden associated with inpatient treatment.

Materials and Methods

Data Source

We used the Ohio Hospital Association inpatient survey to identify patients admitted to hospitals in Ohio with a diagnosis of radiation cystitis. The Ohio Hospital Association inpatient survey contains data from 238 participating hospitals, including community, county and academic institutions. Patient information in the database includes gender, age, insurance information, ICD-9 diagnosis and procedure codes, hospital charges, admission and discharge dates, and geographic information.

Study Population

We identified 1,244 patients older than 18 years admitted to participating Ohio hospitals with a diagnosis of RC from 2009 to 2013. Patients were identified as having RC if ICD-9 code 595.82 was included in the first 5 diagnosis codes on admission. We only included patients with the diagnosis of RC among the first 5 diagnosis codes to try to limit the number of patients included in the cohort with a history of RC but without current symptoms. We chose to include patients with RC up to diagnosis code 5 based on ICD-9 coding standards that allow symptom diagnosis codes (acute blood loss anemia) to be listed above the underlying problem (gross hematuria and radiation cystitis).[11] Overall RC was the primary diagnosis for 59.1% of the cohort and a secondary diagnosis for 14.8%. Pediatric patients (younger than 18 years) were excluded from the cohort. Patients were also excluded if they had a secondary diagnosis of bladder cancer (133), leaving a total of 1,111 patients in the cohort. These 133 patients were excluded to limit the confounding from bladder cancer associated hematuria and blood loss anemia.

Patients were evaluated by diagnosis or history of various pelvic malignancies, including prostate cancer, ovarian cancer, uterine cancer, cervical cancer and colon cancer. These diagnoses were determined using appropriate ICD-9-CM diagnosis codes. Cases were also stratified by the need for blood transfusion or invasive procedures including cystoscopy, cystoscopy with biopsy, cystoscopy with fulguration and percutaneous nephrostomy tube placement. These procedures were also determined using appropriate ICD-9-CM codes. Further information regarding the ICD-9-CM codes used for analysis can be found in the supplementary Appendix (http://urologypracticejournal.com/).

Adjusted in-hospital costs were determined using total hospital charges. Charges from each year were standardized to 2013 dollars using the Consumer Price Index inflation calculator.[12] Costs were then calculated from charges using the fiscal year 2013 average operating cost-to-charge ratio for urban acute care hospitals in Ohio.[13]

Covariates and Outcomes

Covariates used in this study included gender, age at admission, diagnosis of pelvic malignancy, Elixhauser comorbidity index, insurance status, year of admission, LOS and need for blood transfusion or invasive procedures.[14] The primary outcome was the median adjusted in-hospital cost associated with admission for patients with RC. Secondary outcomes included the number of patients requiring endourological procedures, blood transfusions and nephrostomy tube placement.

Statistical Analysis

Multivariable logistic regression analyses were performed to determine if covariates influenced the likelihood of