Reducing Overutilization of Preoperative Medical Referrals Among Patients Undergoing Radical Cystectomy Using an Evidence-based Algorithm

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OBJECTIVE To evaluate the frequency with which preoperative medical evaluations lead to changes in perioperative management of patients undergoing radical cystectomy and to examine the impact of an evidence-based algorithm on referral utilization.

MATERIALS AND METHODS A retrospective review of 176 patients undergoing radical cystectomy in 2013-2014 was conducted. Patients referred for additional preoperative medical or cardiology evaluation were identified and the incidence of diagnostic testing or management changes resulting from such evaluations were determined. The impact of an evidence-based algorithm on referral utilization and identification of patients undergoing changes in perioperative management was examined.

RESULTS Of 176 patients, 111 underwent additional preoperative medical evaluation, with 2.7% undergoing additional diagnostic testing and 8.1% experiencing resultant changes in medical management. Perioperative management changes were minor in scope, with the majority (65%) involving management of hypertension or hypokalemia. Perioperative outcomes were similar between patients undergoing urologic evaluation alone and patients referred for additional preoperative medical evaluation. Applying a referral algorithm incorporating the American College of Cardiology guidelines would have avoided 72% of all medical referrals and reduced direct hospital costs of preoperative evaluations by 74%, while still capturing 94% of all patients who underwent perioperative management changes and all patients with diagnostic findings necessitating surgical delay.

CONCLUSION Preoperative medical evaluation of patients undergoing radical cystectomy infrequently yields perioperative management changes. The algorithm presented would significantly reduce overutilization and direct hospital costs while capturing patients most likely to benefit from additional medical evaluation. UROLOGY ■■: ■■–■■, 2018. © 2017 Published by Elsevier Inc.

Radical cystectomy (RC) is a highly complex procedure with 90-day perioperative morbidity rates as high as 64%[1] and mortality rates of 2.7%-5.1%.[1-3] Comorbid illnesses are common among patients with bladder cancer, due in part to patient age and the association with smoking,[4] and are independently predictive of adverse perioperative outcomes.[5] Comorbidities such as obesity,[5] smoking,[6] hyperglycemia,[7] and nutritional deficiency[8] are potentially modifiable targets for which preoperative optimization may benefit a patient's perioperative outcome. For other comorbid diseases, the benefit of preoperative intervention is less clear. For instance, patients with clinically significant coronary artery disease, who are adequately managed medically, do not benefit from preoperative coronary revascularization before major elective surgery with respect to long-term survival.[9]

Validated tools such as the Revised Cardiac Risk Index (RCRI) have been developed to estimate the risk of adverse perioperative cardiac outcome in patients undergoing elective non–cardiac surgery.[10] Patients at low risk are unlikely to benefit from preoperative cardiac testing, with American College of Cardiology (ACC) and American Heart Association (AHA) guidelines recommending against additional cardiac testing.[11] The benefit of preoperative

Financial Disclosure: *The authors declare that they have no relevant financial interests.*

Nima Almassi, MD, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Submitted: October 3, 2017, accepted (with revisions): December 18, 2017

workup for other medical comorbidities remains poorly defined. Furthermore, studies suggest routine preoperative medical evaluation (PME) before elective surgery rarely yields new recommendations or management changes.[12]

Hypothesizing that PME infrequently yields changes in the preoperative management and does not impact perioperative outcomes of patients undergoing RC, we examined the utilization of PME in patients undergoing RC at our tertiary referral center. We identified the incidence of additional diagnostic testing or new management recommendations based on such evaluations and compared perioperative outcomes of patients undergoing standard preoperative urology and anesthesiology evaluations alone to patients who additionally undergo PME. Based on our findings, we present a referral algorithm incorporating ACC and AHA recommendations[11] and demonstrate how applying this algorithm to our patient population would impact utilization of PMEs and the identification of patients undergoing significant perioperative management changes. Finally, the direct hospital cost savings that would have resulted from implementing this algorithm is estimated.

MATERIALS AND METHODS

Cohort Identification

After obtaining institutional review board approval, we retrospectively reviewed the records of patients who underwent RC at our tertiary referral center in 2013 and 2014. All patients underwent preoperative urology and anesthesiology evaluation. The standard preoperative urologic evaluation includes eliciting the patient's history of presenting illness, medical and surgical histories, review of systems, physical examination, and review of preoperative diagnostic testing. Anesthesiology evaluation is mandatory for anesthesia clearance for patients undergoing major surgery per institutional policy. Patients who additionally underwent PME in a designated internal medicine presurgical clinic or preoperative cardiology evaluation (PCE) were identified. The decision to refer patients for PME or PCE was made by the attending surgeon.

Patients were stratified into 1 of 3 groups based on the extent of preoperative evaluation. Group 1 (standard evaluation) includes patients who underwent preoperative urology and anesthesiology evaluation alone. Group 2 (PME) represents patients who additionally underwent PME within 30 days of surgery in a designated internal medicine presurgical clinic. Group 3 (PCE) includes patients who underwent evaluation by a cardiologist within 30 days of surgery. Additionally, all primary care physician (PCP) evaluations within 90 days of surgery were identified.

Assessing Impact of Specialized Preoperative Evaluation

For each PME or PCE, we determined whether that evaluation resulted in additional testing or perioperative management changes. For groups 2 and 3, we determined the percentage of patients experiencing such management changes. All RC cases that were scheduled to occur during the study period that were later cancelled were identified from the institutional surgical scheduling database. For each cancelled surgery, the reason for case cancellation was determined upon review of the electronic medical record (EMR). All cases cancelled based on findings or recommendations of a preoperative evaluation were identified. Finally, the direct hospital cost associated with each PME and PCE was estimated from our institutional cost accounting database.

Statistical Analysis

Patient characteristics including age, gender, body mass index, clinical stage, medical comorbidities, and American Society of Anesthesiologists (ASA) score were obtained from the EMR. The Charlson Comorbidity Index (CCI) and RCRI were calculated retrospectively for each patient.[10,13] Continuous variables are reported as medians with interquartile range, whereas categorical variables are reported as proportions. The presence of any 30-day complication, major 30-day complication (defined as Clavien III or greater),[14] and 90-day mortality was determined for each patient and incidences were reported for groups 1-3. Continuous variables are compared between groups using the Mann-Whitney *U* test and Kruskal-Wallis test. Proportions are compared using chi-square analysis. All comparisons were two-sided. Multivariable logistic regression analysis controlling for baseline patient characteristics and surgical complexity (duration and estimated blood loss) was used to compare the risk of perioperative morbidity between groups. Statistical significance was set at $P < .05$. Statistical analyses were completed using SPSS Version 20.0 (IBM Corp., Armonk, NY).

RESULTS

Cohort Identification

A total of 176 patients were identified who underwent RC in 2013 and 2014. Baseline patient characteristics are demonstrated in Table 1. The median age at time of cystectomy was 66 years. Seventy-eight patients (44.3%) had a CCI of 1 or greater and 157 patients (89.2%) had an ASA score of 3 or 4.

Thirty-seven patients (21%) underwent standard urologic and anesthesiology evaluation alone (group 1), whereas 111 (63%) underwent additional PME (group 2) and 28 (16%) underwent PCE (group 3). One hundred sixty-two of 176 patients had a PCP listed in the EMR, 40 with PCPs within our hospital network and 122 with PCPs at other institutions. Eleven of 162 patients were identified as having had an office visit with their PCP within 90 days of surgery, 9 from group 2, and 2 from group 3.

Patients in groups 1 and 2 had similar prevalence of previous myocardial infarction, cerebrovascular accident, heart failure, renal insufficiency, and insulin-dependent diabetes mellitus (Supplementary Table S1), with similar RCRI ($P = .6$) and CCI ($P = .06$). Patients in group 3 were older (74.5 years vs 66 years, $P < .001$), with higher prevalence of coronary artery disease (57.1% vs 13.5%, $P < .001$) and previous myocardial infarction (46.4% vs 5.4%, $P < .001$) than patients in group 2, with a higher CCI ($P < .001$) and RCRI ($P < .001$).

Perioperative Management Changes Resulting From Preoperative Evaluations

Few patients in group 2 underwent additional diagnostic testing (3 patients, 2.7%) or change in preoperative man-