Published in final edited form as:

Urology. 2018 November ; 121: 39–43. doi:10.1016/j.urology.2018.07.030.

Functional status in patients requiring nursing home stay after radical cystectomy

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Abstract

Objective: To evaluate the ability to perform activities of daily living (ADLs) in patients who required nursing home (NH) care after radical cystectomy (RC), as this surgery can impair patients' ability to perform ADLs in the post-operative period.

Methods: Patients undergoing RC were identified in a novel database of patients with at least 2 NH assessments linked with Medicare inpatient claims. The NH assessment included the Minimum Data Set (MDS)-ADL Long Form (0–28; higher score equals greater impairment), which quantifies activities of daily living. Paired t-tests and chi-square analyses were used for comparisons.

Results: We identified 471 patients that underwent RC and had at least one MDS-ADL assessment. 245 patients lived elsewhere prior to RC and went to a NH after RC, while 122 patients lived in a NH before and after RC. Mean age of the population was 80.7 years (SD 5.7). Of the 245 patients who did not live in a facility before RC, 68% of patients were discharged directly to a NH and 31% were discharged to another location before NH. There was no difference in MDS-ADL score between these groups (16.4 vs 15.0, $p=0.09$). Among the patients who lived in a NH before and after RC, the mean pre- and post-operative MDS-ADL scores were significantly different (12.1 vs 16.6, $p<0.0001$).

Conclusion: ADLs, as measured by the MDS-ADL Long Form score, worsen after RC. This should be an important part of the risks and benefits conversation with patients, their families, and caregivers.

Keywords

activities of daily living; functional status; nursing home; radical cystectomy

Introduction

Bladder cancer is among the ten most common cancer diagnoses, with more than 79,000 new cases and an expected 16,870 deaths in 2017 in the US alone.¹ Radical cystectomy (RC) with bilateral pelvic lymph node dissection and urinary diversion is the standard of care for non-muscle invasive bladder cancer that has failed treatment, and is the gold standard for T2-T4aN0M0 (muscle invasive) bladder cancer.²⁻⁴

Patients with bladder cancer are often of advanced age with significant co-morbid conditions; 59.1% have hypertension, 19.3% have diabetes, and 8.8% have COPD. Additionally, 2.9% used steroids and 17.7% had neoadjuvant chemotherapy prior to surgery, which contributes to surgical risk.^{5,6} Among urological procedures, RC has the highest complication rate; 26% of younger patients (age < 65) were readmitted to the hospital with medical or surgical complications within 90 days.⁷ Patients often endure prolonged hospitalization, with mean length of stay of 10.8 days. At the time of discharge, most patients can return home, although as many as 4.4% require short-term rehabilitation and 9.4% require skilled nursing care.⁸ Mortality rates after RC are reported between 2 and 7% at 90 days.^{9,10}

In response to the Omnibus Budget Reconciliation Act of 1987, every nursing home (NH) that receives Medicare or Medicaid payments must gather data on patients' activities of daily living (ADLs) using the Minimum Data Set (MDS). Data are used develop comprehensive care plans for residents. The MDS quantifies ten ADLs (bed mobility, transfer, walk in room, walk in corridor, locomotion on unit, locomotion off unit, dressing, eating, toilet use, and personal hygiene). This assessment is mandated within 14 days of NH admission and quarterly (every 90 days) thereafter. Many states also require additional assessments within 30 days of admission. The MDS is widely used in geriatrics research due to its proven inter-observer reliability and ease of administration.¹¹

Activities of daily living have predictive value for readmissions and mortality in a variety of conditions. For older adults, ADLs are associated with quality of life, hospital admission, health, and mortality.¹²⁻¹⁴ Geriatric patients with impaired baseline physical function are significantly more likely to have readmission within 30 days of an acute hospitalization.¹⁵ Impaired ADLs correlate with all-cause readmission for heart failure, myocardial infarction, and pneumonia.¹⁶ Patients with worse functional status at the time of discharge to rehabilitation facilities are also more likely to be readmitted to acute care settings.¹⁷

While discussing the risks and benefits of surgery, physicians must help patients understand the expected post-operative course, which may include planning for post-discharge care. No previous studies have focused on activities of daily living after RC. The objective of this study was to evaluate functional status by reviewing activities of daily living in patients who received nursing home (NH) care upon hospital discharge after RC.

Materials and Methods

Data were obtained from an existing database designed for another study of long stay (>76 days in a facility) nursing home residents.¹⁸ This database included 2006 and 2007 MDS

assessments (Version 2.0) of long-stay nursing home residents that were linked to Medicare inpatient claims. MDS assessments were included for patients with a Medicare inpatient claim for cystectomy with urinary diversion. We used Current Procedural Terminology codes (51570, 51575, 51580, 51585, 51590, 51595, 51596) and International Classification of Diseases, Ninth Revision (ICD-9) codes (57.7, 57.71, 57.79) to identify RC procedures. ICD-9-CM Codes (188.0–188.9, 233.7) were used to identify bladder cancer diagnosis.¹⁹ Neither MDS data nor Medicare claims included pathological data.

As part of an MDS assessment, trained care providers observe each patient's ability to perform ADLs over the course of one week. Each ADL is scored on a 0 to 4 scale, where 0 indicates complete independence in that activity and 4 represents complete dependence (Table 1). Item scores of 8 indicate that an activity did not occur in the prior week and were recoded to 4. Scores for seven ADLs (bed mobility, transfer, locomotion on the unit, dressing, eating, toilet use, and personal hygiene) are summed to calculate the MDS ADL Long Form Score (range 0–28, higher score represents worse physical function).²⁰

Because the MDS is administered quarterly, we excluded hospital admissions during the first quarter of 2006 (January to March) to capture baseline MDS assessments that were performed before surgery. Patients were also excluded if they had no MDS assessments after April 2006. MDS-ADL scores were calculated within 14 days of NH admission. For patients who lived in a NH prior to RC, the last MDS prior to surgery was used for comparison. Patients with more than 1 MDS assessment were evaluated within 3 months after surgery for return to baseline. A score within two points of the pre-operative MDS-ADL measurement was defined as a return to baseline. Location after discharge from hospital was determined based on inpatient claims records.

All statistical analyses were conducted using SAS for Windows version 9.4 (SAS Institute Inc., Cary, NC). Descriptive statistics were used to describe the population. T-tests and chi-square analysis compared residents who resided in a nursing home or in their residence before RC. $P < 0.05$ was considered statistically significant for all analyses. For residents who resided in the nursing home before surgery, multiple regression was performed using gender, number of days between surgery and the assessment, age, and preoperative MDS score as covariates to determine what variables were associated with worsening ADL function (increase in MDS-ADL Long Form score). This study was granted exemption by the Institutional Review Board at the University of Missouri, as it was analysis of pre-existing, de-identified data.

Results

Figure 1 shows the inclusion of patients in the study. A total of 471 patients underwent a radical cystectomy and had at least one MDS assessment completed post-operatively. Of those patients, 122 lived in a nursing home prior to RC and 245 did not live in a nursing home. As noted in Figure 1, we excluded 104 patients because their location prior to RC was unknown. Most patients were Caucasian (91%), and 67% were men. Mean age was 80.7 years (standard deviation [SD] 5.7 years) at the time of surgery. Median length of hospitalization after radical cystectomy was 12 days (mean 16.3, SD 14.2). Of 17 patients

with no post-surgery MDS assessments, three died in the hospital and four died within 30 days of hospital discharge.

Nursing home residence prior to RC

Patients who lived in a nursing home prior to RC have both pre- and post-operative MDS data. This group was mostly male (60%) and mostly Caucasian (90%), with a mean age 81.2 years (SD 6.3, range 69 to 96 years). The median time between date of surgery and first MDS was 19 days. Pre-operatively, these patients had a mean MDS-ADL of 12.1 (SD 6.2). Mean activity scores (Table 2) were at least 1 for all activities except eating, indicating a need for oversight or cueing. Dressing, toilet use and transfer had scores of 2 or more, indicating a need for physical help with the activity. Mean MDS-ADL worsened post-operatively to 16.6 (SD 6.5, $p<0.0001$), indicating a need for more assistance with four to five of the ADL activities. Mean scores for all seven ADL activities worsened after RC. The ADLs with the largest functional declines (score increases) included bed mobility, transfers, and locomotion within the unit. Following surgery, item scores for transfer, dressing and toilet use were near 3, indicating a need for extensive physical assistance with that activity. Multiple regression analysis determined that change in ADL score was not associated with age, gender, or number of days between surgery and nursing home admission. Length of inpatient stay approached statistical significance ($p=0.08$). Multiple regression analysis showed that pre-cystectomy ADL score is positively associated with post-operative ADL score ($p<0.0001$) when adjusting for age, gender and number of days between surgery and MDS assessment.

Among these patients, 118 of the 122 had 2 or more ADL scores within 3 months after surgery. At this time after surgery, 51% (60 patients) had returned to their baseline pre-operative ADL score.

Residence elsewhere prior to RC

Patients that did not live in a nursing home prior to RC but needed NH care post-operatively only have post-operative ADL data. As such, their post-RC ADLs were assessed separately. This group was mostly Caucasian (92%) and mostly male (71%), with a mean age of 80.8 years (SD 5.3). The median time between date of surgery and first MDS was 21 days. Most of these patients were discharged directly to NH ($n=168$) with a mean MDS-ADL score of 16.4 (SD 5.3) at NH admission. According to hospital discharge data, a subset of the patients was discharged to a location other than a NH before subsequent NH admission ($n=77$). Upon NH admission, the mean MDS-ADL score for these patients was 15.0 (SD 6.2). MDS-ADL score did not significantly differ between the patients who were discharged directly to NH or who were discharged elsewhere before admission to NH ($p=0.09$). Toilet usage and locomotion required the most assistance from caregivers in this patient group (Table 3).

The MDS-ADL scores after surgery were very similar between the two groups (mean 16.6 in NH population and mean 16.0 in the group that lived elsewhere prior to surgery).

Discussion

This study used a novel database to evaluate functional status in patients that underwent RC and required nursing home care after surgery. In the subset of patients who lived in a NH both before and after surgery, we report that functional status declined substantially after RC. At present, MDS assessments are only completed in the NH setting and are not used as part of standard outpatient or inpatient evaluation, which precluded determining functional change in patients who lived elsewhere prior to RC.

Poor baseline functional status may predict need for skilled nursing care after surgical intervention. Although it seems intuitive to gauge patients' physical abilities prior to surgery, objective measures, although available, are rarely utilized in the healthcare setting to assess physical function in a single encounter. This prevents objective measurement of functional status over time. Older age can implicitly bias providers' perception of frailty, even though age does not directly correlate with ability to withstand surgery or risk of severe post-operative complications.^{21,22} As such, perhaps it is time to utilize validated measures, such as the MDS-ADL Long Form scale, to assess and follow physical function in an objective manner. ADL independence has been associated with higher quality of life while impairments are associated with hospitalizations and death.^{23,24}

Although there is a wealth of research on morbidity and mortality after RC, the literature is much more limited on the functional status of these patients. Previously, pre-operative dependence and partial-dependence have been used as a rudimentary estimate of functional status; dependent or partially-dependent patients are more likely to have surgical complications when compared to independent peers.⁵ The modified Frailty Index (mFI) consolidates the Canadian Study of Health and Aging (CSHA) Frailty Index into an 11-variable evaluation that is compatible with NSQIP data.²⁵ Higher modified Frailty Index score correlates with increased likelihood of being discharged to non-home care after RC, regardless of surgical and in-hospital complications.⁸ This has proven especially helpful for evaluating surgical risk in patients younger than 80 years old.²¹ Unfortunately, non-NSQIP facilities may not have the information to calculate mFI, which limits its use.²¹

At present, clinicians lack a reliable method to evaluate risk of or need for discharge to a nursing facility. Traditional pre-operative risk assessment and comorbidity tools, such as American Society of Anesthesiology (ASA) class and Charlson Comorbidity Index (CCI), predict risk for intraoperative complications but their scores do not translate to functional status at the time of hospital discharge. Interestingly, poor pre-operative exercise tolerance correlates with discharge to a nursing facility but this measure may not be clinically translatable because it requires additional medical evaluation.²⁶ After surgery, positive surgical margins and longer length of stay (LOS) are associated with discharge to a nursing facility.^{26,27} Studies in other disease processes have shown that declines in functional status occurred regardless of invasiveness.¹⁸ Although it cannot predict risk of NH placement at the individual level, RCs performed at high volume hospitals (> 8 cystectomies/year) have a lower rate of discharge to nursing facilities, which validates the trend towards referral to tertiary surgical centers for radical cystectomy as an appropriate intervention.

We observed a significant decline in patients' functional status following RC. Of the measured ADLs, eating had both the lowest raw score (highest functional status) and the least pre- to post-operative change. This confirms previous reports that eating is well preserved and is often the last ADL to decline. The activities that require a combination of gross motor function and strength, such as bed mobility, transfer, dressing, locomotion and toilet usage, demonstrate both greater baseline impairment as well as significant worsening after surgery, suggesting overt impairment in the activities that are foundational for independence. Post-cystectomy, the mean ADL score and the seven individual item scores were similar for patients who did not live in the NH prior to surgery and those who did. The patients living in NH had a higher score on all ADL's after surgery than those that started at home except for locomotion on the unit. This indicates the intensity in which RC affect functional status based on ADLs. Further studies are needed to elucidate RC's effect on functional status and ADLs in patients that discharged to locations other than NH.

This study has several limitations worth noting. Although these data were collected a decade ago, it is novel, valid and the first of its kind for urological procedures. Since the database's primary intent was to study nursing home residents, we do not know the total number of RCs that were performed during this period nor do we know the type of urinary diversion. This data set does not include patients who only ever had a short nursing home stay during this period. Thus not all patients who had a SNF stay are included. Baseline functional status is only available for the subset of patients that lived in the nursing home prior to surgery. The MDS is administered within 14 days of NH admission, but the timing of MDS administration after surgery is variable; this may have also omitted people with brief post-surgical NH stays. Reason for NH admissions, both pre- and post-operatively, was unavailable. Pathological data were not available. Despite limitations, this novel dataset is currently the most comprehensive evaluation of ADLs in patients undergoing radical cystectomy; we hope it will provide a foundation for prospective evaluation of ADLs regarding RC outcomes and peri-cystectomy interventions, including prehabilitation and enhanced recovery protocol outcomes.

Conclusion

Functional status, as measured by the MDS-ADL Long Form score, worsens after RC with urinary diversion. This is an important likelihood to communicate to patients and their family caregivers. Measuring ADL function prior to surgery, throughout hospitalization, upon discharge, and at follow-up may allow more appropriate selection of discharge location after RC.

Acknowledgments

Research reported in this publication was supported by the National Institute on Aging of the National Institutes of Health (R01AG028476) and the Agency for Healthcare Research and Quality (R24HS022140). The content is solely the responsibility of the authors and does not necessarily represent the official views of either the National Institutes of Health or the Agency for Healthcare Research and Quality.

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Figure 1.
Derivation of the study population of patients with bladder cancer who underwent radical cystectomy and resided in a nursing home following surgery.

Table 1.

Description of scoring for Activities of Daily Living (ADL) self-performance items.

Score	Description
0	Independent-no help or oversight-OR-help/oversight provided only 1 or 2 times during last 7 days
1	Supervision-Oversight, encouragement or cueing provided 3 or more times during last 7 days-OR-Supervision (3 or more times) plus physical assistance provided only 1 or 2 times during last 7 days
2	Limited assistance-Resident highly involved in activity; received physical help in guided maneuvering of limbs or other non-weighted bearing assistance 3 or more times-OR-More help provided only 1 or 2 times during last 7 days
3	Extensive assistance-While resident performed part of activity, over last 7-day period, help of following types(s) provided 3 or more times: <ul style="list-style-type: none"> - Weight-bearing support - Full staff performance during part (but not all) of last 7 days
4	Total dependence-Full staff performance of activity during entire 7 days
8	Activity did not occur during past week (recoded to 4)

* From Minimum Data Set (MDS)-Version 2.0, Centers for Medicare and Medicaid Services, September 2000.

Table 2.

Mean ADL activity scores for patients who lived in a nursing home prior to radical cystectomy (n=122).

ADL activity*	Last MDS prior to surgery	First MDS after surgery	Pre- to post-surgery change	
			Mean	95% CI
Bed mobility	1.59	2.39	0.80	0.56, 1.03
Transfer	1.95	2.62	0.66	0.47, 0.86
Locomotion on unit	1.80	2.49	0.69	0.45, 0.93
Dressing	2.05	2.65	0.60	0.42, 0.78
Eating	0.62	1.07	0.45	0.16, 0.74
Toilet usage	2.22	2.96	0.74	0.53, 0.95
Personal hygiene	1.92	2.44	0.53	0.33, 0.72

* Each activity is scored from 0–4, where 0=complete independence and 4=complete dependence.

Table 3.

Mean ADL activity scores for patients who lived outside of a nursing home prior to radical cystectomy and went to a nursing home postoperatively (n=245).

ADL activity	First MDS after surgery	95% CI
Bed mobility	2.32	2.18, 2.45
Transfer	2.47	2.35, 2.59
Locomotion on unit	2.61	2.46, 2.77
Dressing	2.50	2.39, 2.61
Eating	0.82	0.68, 0.97
Toilet usage	2.91	2.79, 3.02
Personal hygiene	2.29	2.16, 2.43

* Each activity is scored from 0–4, where 0=complete independence and 4=complete dependence.