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Strategies to minimize readmission rates following major urologic surgery

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Abstract: Readmissions after major surgical procedures are prevalent across multiple disciplines. Specifically, in urology, with incorporation of early discharge and recovery pathways, readmissions are emerging as an important problem and effecting an epidemic proportion of urology patients. As expected, readmissions have garnered the attention of major healthcare payers in the United States who see readmissions as easy targets because of the association with astronomical costs. More importantly, readmissions have a significant negative impact on patient sense of wellbeing, and places economic and other hardships on the doors of our patients and their families. Here, we explore the reasons patients are readmitted, using radical cystectomy as a case study, and means to decrease the incidence of readmissions. Since time to readmission for most major urologic oncology surgeries is within the first 2 weeks after discharge, this time frame is critical for efforts to improve symptom identification and reduce the total number and severity of readmissions. Readmission reduction to zero is unlikely for any major surgery, but with effective coordinated strategies, we must strive to reduce the rates as much as possible, as a means to improve the care continuum for our patients.

Keywords: cystectomy, delivery of health care, health planning, patient readmission, urologic surgical procedures, urology

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Introduction

A dictum of surgery is that 'if you operate enough, you will have complications.' A significant complication will often result in readmission to the hospital, and these readmissions continue to be very prevalent after major surgical procedures across multiple disciplines. Almost one third of patients are readmitted after major surgery.[1] In urologic surgeries, with the adoption of early discharge in our aging population, readmissions are more prominent than most would like to admit. Readmissions have begun to draw the attention of major healthcare payers in the United States, largely due to the astronomical costs; it is estimated readmissions account for $15 billion per year in healthcare costs.[2] More importantly, readmissions have a significant negative impact on patient sense of wellbeing and place economic and other hardships on the doors of our patients and their families. Fortunately, a broad range of database and retrospective studies have been carried out to inform this area and provide us with clues on how to combat this epidemic. Here, we explore readmission prevalence, risk factors for readmission, and using the surgery, which is our biggest offender (hint: radical cystectomies!), we discuss how to possibly combat the 'readmission epidemic'.

Preventable readmissions and readmission consequences in urology

There is a broad range of reasons for patients being readmitted after major urologic surgery. These reasons can be divided into two major subcategories: medical and surgical. Medical complications represent a large portion of reasons for readmission in most major urologic surgeries.[3] For example, a venous thromboembolism after a radical prostatectomy, one of the leading causes

of readmissions in this group, is categorized as a medical readmission.[4] While assigning medical and surgical categories helps identify the readmission root cause, the focus of root cause readmission analysis should be centered on reoccurring offenders of readmissions, regardless of medical or surgical origins. Identifying nonmodifiable risk factors is important, but unlikely to change the eventual outcomes. For instance, chemotherapy is often incorrectly attributed as a risk factor (nonmodifiable) for readmissions, however, neither retroperitoneal lymph node dissection (RPLND) nor cystectomy patients actually have an increased readmission rate associated with presurgical chemotherapy.[5] However, the prostatectomy patient with a venous thromboembolism is considered a medically modifiable risk, where continuing venous thromboembolism prophylaxis after discharge may have avoided the outcome of venous thromboembolism and thus the readmission. Hence, focusing on modifiable risk factors, whether medical or surgical, should improve the readmission density.

Interestingly, those discharged to a skilled nursing facility or a rehabilitation facility (SNF) are more likely to have readmissions than those with other discharge destinations (home or home, with home health).[6,7] This is an interesting phenomenon and could stem from a few possible reasons: (1) patients going to SNF are sicker or had more complications during their index hospitalization and thus require more readmissions for underlying medical and surgical issues; (2) SNFs are not equipped with the understanding of complex surgeries (e.g. urinary diversions) their patients have undergone, leading to readmissions; or (3) the reliance on SNFs leads to a premature transference of care from the inpatient side before our patients are actually ready for discharge form acute hospital care.

Current readmission rates and associated risk factors for major urological surgeries

As stated above, readmissions are common after all major surgery, not just in urology,[8] and are a frustrating reality for most surgeons. Radical cystectomy remains one of the most complex surgeries in oncology and is associated with the highest rate of readmission for all major oncology surgeries including esophagectomies, lung resections and pancreatectomies.[9] Table 1 details the major urology surgery time to readmission. Figure 1 shows the timing to readmission for major urologic oncology surgeries. In this figure, radical cystectomy readmissions can be seen as far more common than the other included procedures. Thus, in order to make the most significant impact for our patients, we can use radical cystectomy as a case study to identify the leading modifiable and nonmodifiable risk factors. Table 2 details readmission risk factors and readmission reasons for patients undergoing radical cystectomy, partial nephrectomy, radical nephrectomy and radical prostatectomy.

Several studies have demonstrated there are no dependable or consistent predictors of readmission. Part of the issue may be that while there have been many small and large cohort studies, a consistent qualifier for readmissions that applies to all major urologic surgery has yet to be identified. For example, variables expected to be associated with readmission such as age, sex, comorbidities and higher ASA scores are not consistently associated with readmissions.[6,9,10,12,25] Patient characteristics remain poor targets for modification in decreasing readmissions due to the fact they usually only explain a small fraction of deviation in final outcomes, and their risk factors (e.g. age, sex) are often not amenable to modifications.[26] One factor is clear: a complication during the index hospitalization predisposes patients to readmission, however, ultimately, many other reasons exist outside of postoperative complications.[12]

Although age is not modifiable, it continues to often be a risk factor associated with readmission. Readmission of older adults is often to outside hospitals and may not even be reported to the operating surgeon.[14,15] In addition, more comorbidities in the elderly may also contribute to readmissions.[24,27] While older age and increasing comorbidities are risk factors, they likely have interactions with each other, leading to increased readmissions in this population.[21] Thus, elderly patients with multiple comorbidities should heighten awareness of the increased readmission rates and encourage vigilance when caring for this patient group after a major urologic surgery.

Cystectomy-specific readmission timing, risk factors and care implications

Hu and colleagues reviewed SEER-Medicare data for 1782 patients undergoing cystectomy between 2003 and 2009 with a 30-day readmission rate of 26%.[11] For this cohort, the average

Table 1. Readmissions for urologic surgeries.

Surgery	30-day % (95% CI*)	90-day % (95% CI*)	References
Cystectomy	20.7–28.5 (26.5–30.4)	26.6–40.4 (37.8–41.4)	Stimson *et al.*,[10] Hu *et al.*,[11] Leow *et al.*,[12] Minnillo *et al.*,[6] Pak *et al.*,[13] Chappidi *et al.*[14,15]
Open	19.7	26.6	Stimson *et al.*[10]
MIS	15.6	25.5	Al-Daghmin *et al.*[16]
Radical nephrectomy	6.8–9.0 (8.2–9.8)	15.3 (14.2–16.5)	Leow *et al.*,[12] Chappidi *et al.*[14,15]
Open	6.6	ND	Schmid *et al.*[4]
MIS	4.2–6.1	ND	Autorino *et al.*,[17] Schmid *et al.*[4]
Partial nephrectomy	6.3–9.7 (8.6–10.9)	13.3 (12.2–14.6)	Leow *et al.*,[12] Chappidi *et al.*[14,15]
Open	6.4–7.8	ND	Autorino *et al.*,[17] Patel *et al.*,[18] Schmid *et al.*[4]
MIS	3.2–4.5	ND	Autorino *et al.*,[17] Patel *et al.*,[18] Schmid *et al.*[4]
Nephroureterectomy	10.4 (8.7–12.3)	17.7 (15.4–20.2)	Chappidi *et al.*[14,15]
Open	ND	ND	
MIS	ND	ND	
Prostatectomy	3.8–4.0 (3.7–4.3)	5.4 (5.0–5.8)	Leow *et al.*,[12] Chappidi *et al.*[14,15]
Open	3.5–5.5	5.9	Gandaglia *et al.*,[3] Pilecki *et al.*,[19] Schmid *et al.*[4]
MIS	3.7–5.5	5.5	Gandaglia *et al.*,[3] Pilecki *et al.*,[19] Schmid *et al.*[4]
RPLND	14.9 (10.1–21.5)	18.9 (12.9–26.9)	Chappidi *et al.*[14,15]
Open	ND	ND	
MIS	ND	ND	

*95% confidence interval (CI) was only included in one study, thus the numbers presented here are only for Chappidi *et al*. However, the 95% CI is important to include, as well as the other study values because there are wide ranges for the reported readmissions.
ND, no data; MIS, minimally invasive surgery; RPLND, retroperitoneal lymph node dissection for testicular cancer.

length of stay was 11 days and length of stay was not associated with readmissions.[11] The mean time to readmission was 11.5 days after discharge: 40% of cystectomies were readmitted in week 1 after discharge and two thirds by week 2 after discharge.[11] The leading cause for readmission was infection, however, infections were determined to not be associated with readmission in the first week.[11] Notably, many of the infections were serious, with 26% having readmission to the intensive care unit (ICU).[11] In another study, it was found that not only are readmits likely to need ICU care, they also resulted in a higher likelihood of a patient needing to be discharged to a SNF after their readmission, OR 3.8 [95% confidence interval (CI): 2.88–4.98].[6] Not surprisingly, those with prolonged index admissions were also most likely to be those who were readmitted within 2 weeks after surgery (77%).[28] While most patients with a readmission have a new diagnosis when they are readmitted (86%),[11] any complication during the index stay remains associated with readmission.[11,28]

Delving further into this root cause analysis, of the aforementioned, authors found that even though the readmissions were within 2 weeks after discharge, the patient's symptoms associated with the ultimate readmission began appearing around postdischarge days 4 and 5.[29] Krishnan *et al.* developed a model and found that increasing contact with the patient, either *via* office visits or telephone calls, may decrease readmissions by facilitating early recognition of problem. For example, while some readmissions can be detected by an office visit (16%), the model showed that detection is increased by an office visit followed by four telephone calls.[29]

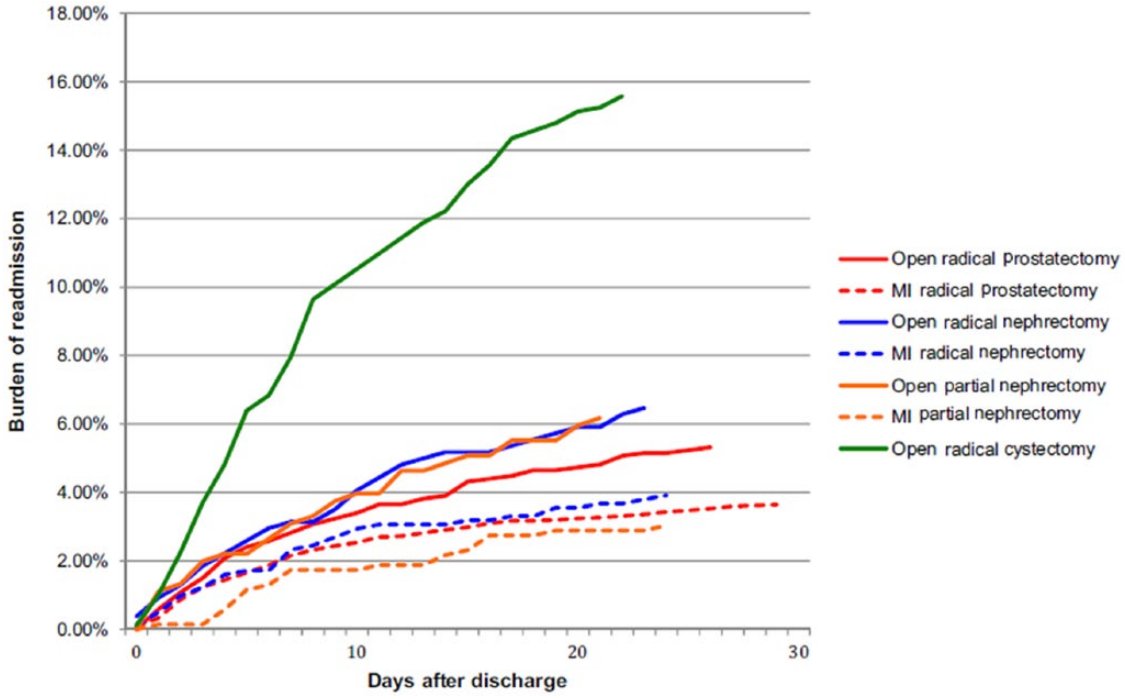

Figure 1. The burden of readmission for common major urologic surgeries from the 2012 National Surgical Quality Improvement Program (NSQIP) data. Reprinted with permission from Schmid *et al.*[4] © 2016 Elsevier.
MI, minimally invasive.

Using the national readmission database, Chappidi and colleagues compared the incidence, characteristics and costs of index and nonindex hospital readmissions for cystectomy patients;[14,15] 'nonindex' meaning the readmission was at a different hospital than where the cystectomy took place. This study found care fragmentation and nonindex hospital readmissions in urology are vastly underestimated.[14,15] Care fragmentation disrupts the continuity of care when another urologist takes care of a patient rather than the operative urologist.

Not sparingly, nonindex late readmissions were seen more often in older patients who had cystectomies at high-volume centers and then were often readmitted to more rural areas.[14,15] This is likely due to the centralization of this complex procedure, where many patients travel to urban centers to receive their acute care but then travel back to rural areas to recuperate. Complications managed by nonindex hospitals were often cardiac in nature, whereas wound and gastrointestinal complications were more likely to prompt return to the index hospital.[14,15] Overall, nonindex readmissions were associated with index cases which had longer lengths of stay, patients living in less populous areas, index cases done at nonteaching hospitals and discharge to SNFs.[14,15] The work done by Chappidi *et al.* shows large-volume centers can significantly impact the national distribution patterns of readmissions, reduce care fragmentation and should serve as an impetus for all high-volume centers to reduce our readmissions.[14,15]

In all three large cystectomy readmission studies above, there is evidence the continued regionalization of cystectomy care can support high levels of care quality, aided with nonindex institutions, however the communication between the two institutions is critical to patient care.[14,15] Additionally, sometimes an ill patient has a hard time making their way back to their index surgical hospital, there is potential with the regionalization of care; these problems may increase and lead to inferior outcomes.[30] Because index hospitals are often tertiary care centers, admission to an ICU at the index hospital can decrease mortality. Thus, if a readmission is required, reasonable efforts should be made to return the patient to the index hospital if possible, since this may not only decrease care fragmentation, but could also be lifesaving.[8,13]

Currently implemented strategies for healthcare improvement and effects on readmissions

We must point out that techniques to improve patient care may not directly reduce readmissions

Table 2. Risk factors and reasons for readmissions after major urologic surgery.

Surgery	Days from discharge to readmission	Risk factors	Top diagnoses associated with readmission (%)	References
Cystectomy	8.5	Obesity Operative time BMI Female sex Age-adjusted CCI Age Urinary diversion type SNF Any complication	Infection (32.9) Sepsis (16.9) Wound (13.5) UTI (8.0) VTE (8.6) Pulmonary (2.8) Transfusion/bleeding (2.1) Unplanned reoperation	Stimson *et al.*,[10] Al-Daghmin *et al.*,[16] Leow *et al.*,[12] Minnillo *et al.*,[6] Djaladat *et al.*,[20] Schmid *et al.*,[4] Chappidi *et al.*[14,15]
Radical nephrectomy	8.6*	DM Steroid use History of bleeding diathesis IVC thrombus with discharge before POD 2 and after POD 9 ASA Any complications	Transfusion/bleeding (2.9) Wound (12.9) Sepsis (4.3) Pulmonary (5.7) VTE (2.9) UTI Unplanned reoperation	Leow *et al.*,[12] Autorino *et al.*[17] Hwang *et al.*,[21] Schmid *et al.*,[4]
Partial nephrectomy	9.1*	CCI ⩾ 5 Prolonged LOS Race ASA Score Nephrometry score	Transfusion/bleeding (9.8) Wound (7.8) Sepsis (5.9) VTE (5.9) Unplanned reoperation	Brandao *et al.*,[22] Maurice *et al.*,[23] Schmid *et al.*,[4]
Prostatectomy	8.7*–16	Age ASA Smoking Any complication	VTE (13.6) Wound (12.2) Sepsis (8.6) Transfusion/bleeding (2.3) UTI Unplanned reoperation	Pilecki *et al.*,[19] Hemal *et al.*,[24] Schmid *et al.*[4]

*Only 30-day study.
CI, confidence interval; ND, no data; MIS, minimally invasive surgery; BMI, body mass index; SNF, skilled nursing facility; VTE, venous thromboembolism; RPLND, retroperitoneal lymph node dissection for testicular cancer; UTI, urinary tract infection; POD, postoperative day; DM, diabetes mellitus II; IVC, inferior vena cava; CCI, Charlson Comorbidity Index; LOS, length of stay; ASA, American Society of Anesthesiologists.

yet have a positive influence in other areas of care quality improvement. Both minimally invasive (MI) surgery and enhanced recovery after surgery (ERAS) programs improve patient care in a number of ways, but this does not always translate to a reduction in readmissions. Early discharge for multiple surgeries has been shown to decrease costs without adversely increasing mortality or readmissions.[31]

Unfortunately, our biggest offender of readmissions, radical cystectomies, are not decreased with MI techniques. MI cystectomy still has a readmission rate of 26% within 90 days, of which 60% are in the first 30-day period.[16] This is in contrast to MI partial nephrectomies, as well as MI radical nephrectomies, which do have a comparatively decreased readmissions ratio, odds ratio (OR) 0.68 and 0.83, respectively.[4,17]

Infection remains the most common reason for readmission during any postoperative period for cystectomies. Interestingly, while infection has always been a large part of cystectomy readmissions, in the ERAS era, infection has become a major leading cause of readmissions.[20] Additionally, it should be noted, for the data in much of this review, the implementation of ERAS is not considered and the timing of readmissions still needs to be evaluated in this patient cohort. The introduction of ERAS will likely further increase the variation of care, change the care

dynamics and possibly the timing of readmissions. ERAS patients may have different needs for readmission prevention, however, they likely can be addressed by building interventions into the preexisting ERAS framework.

Readmission prevention

In general, the continuum of care around major urologic surgery takes part in three contiguous, yet distinct healthcare system entities: preoperative care, index hospitalization and follow up after discharge. All three of these areas are ripe for intervention to avoid readmissions.[32]

Efforts to reduce readmission rates begin prior to admission. Education of the patient with regards to in-hospital and postdischarge expectations are important, as is early recognition and dialogue between the referring doctor (especially in rural areas) and high-volume surgeons. Preoperative care optimization should be considered for all major urologic surgeries, ranging from focusing on nutrition status to cardiac interventions.[32] Although some oncologic surgeries are not necessarily 'elective' *per se*, the lead time to surgery should usually allow for some level of optimization. Readmission prevention should start before the surgery is ever performed with ERAS principles. Examples of these principles include consistent information for patient education and prehabilitation.[11] Consistent education and empathetic care may decrease patient anxiety, for example, in kidney transplant patients, consistent education delivered with empathetic care was associated with decreased anxiety levels 1 week after discharge and decreased readmissions at 30 days.[33] Ways to reduce anxiety are to standardize the information conveyed and to have trained providers communicating the information to caregivers.[33] Additionally, preoperative smoking-cessation counseling, important for many reasons, may also reduce readmissions.[24]

Care during the index hospitalization should adhere to practice guidelines for prevention of common complications, such as surgical site infections, prevention of venous thromboembolisms and continued optimization of medical conditions.[32] Patients should be encouraged to follow the ERAS pathway, yet should also be encouraged to voice their perception of readiness for discharge. From the index hospitalization, discharge planning and transitions of care are crucial to preventing fragmentation of care and readmissions.[32]

Postdischarge efforts should focus on the first 2 weeks because this is where the most readmissions are seen with all the major urologic surgeries. Focusing on the early symptoms of readmission may decrease the acuity of those readmitted.[11]

Follow-up care should focus on modifying readmission factors and vigilance in early detection of potential complications. This allows for assessment and planning to address complications that arise early, decrease their severity, and should decrease resource utilization when a readmission is not preventable. Early identification of readmission symptoms can be achieved in many easy and innovative ways.

One innovative way to reduce readmission may be telemedicine. Telemedicine has shown promise in the reduction of readmissions after acute myocardial infarction.[34] Telemedicine visits early after discharge with the urology provider could also improve communication with the patient. For our aging population, the question often comes up as to whether patients will be amenable to using telemedicine technology. Interestingly, in a survey, two thirds of urology patients said they would be willing to participate in a telemedicine visit.[35] Additional telemedicine technology includes mobile apps and wearable technology.[36] Although reimbursement for telemedicine is not well established, any means to reduce readmissions may initiate investments in the technology with later realized cost savings.[36]

Communication remains the cornerstone of quality healthcare. For most medical patients, early follow up after discharge does not reduce readmissions.[37] However, for surgical patients, this does offer a promising way to lessen the readmission burden. Early support from primary care providers can reduce readmissions by almost 20% after high-risk vascular and ventral hernia surgery.[38] Primary care provider integration and transitions are critical to decreasing care fragmentation and minimizing readmissions.[38] Timely outpatient appointments and telephone follow up may decrease the anxiety of the patient, as well as detect postoperative complications before they become critical and require ICU admissions.[39] Discharge communication is very important, especially to those going to SNFs, since these are often the source of readmissions.[7,39] Standard discharge templates can be helpful, as well as direct communication with primary care providers.

Some logistical problems arise when looking across the continuum of care for these surgical patients. As it stands, health information systems do not communicate optimally across the continuum, with a lot of variation in understanding of the patients, processes and care provided between healthcare providers.[40] Coordination of care is critical to preventing readmissions.[6] Further to this end, perhaps regionalization of SNF facilities specializing in certain surgical operation recovery (e.g. after cystectomy) would be financially beneficial for both the hospital and the SNF. With better understanding of the care required and certain types of surgical patients they are caring for, SNFs could help prevent readmissions.

Conclusion

Readmission of urology patients after major surgeries remains a real and increasing problem. This puts an immense burden on our patients, their families, as well as contributing to health care costs and draining resources. Furthermore, punitive financial consequences are looming on the horizon for readmissions. Thus, an emphasis and focus on urology readmission prevention is of utmost importance. Cystectomies remain the main target of improvement for our discipline and could serve as a model for other major surgeries if readmissions can be successfully lowered. While the overall objective should be to reduce the need for readmissions to the ICU by early identification of postdischarge problems. Efforts focusing on the postoperative period in the first 1 to 3 weeks after discharge are likely to be the most productive. Multiple strategies exist in other areas of medicine and should be employed and studied as a means for readmission reduction in urologic patients undergoing major surgeries.

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