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Characterizing readmission in ulcerative colitis patients undergoing restorative proctocolectomy

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Abstract

Background—Postoperative readmissions increase costs and affect patient quality of life.

Ulcerative colitis (UC) patients are at a high risk for hospital readmission following restorative proctocolectomy (RP).

Objective—To characterize UC patients undergoing RP and identify causes and risk factors for readmission.

Design—A retrospective review of a prospectively maintained institutional database was performed. Postoperative readmission rates and reasons for readmission were examined following RP. Univariate and multivariate analyses were performed to evaluate for risk factors associated with readmission.

Results—Of 533 patients who met our inclusion criteria, 18.2% (n=97) were readmitted within 30 days while 22.7% (n=121) were readmitted within 90 days of stage I of RP. Younger patient age (OR 1.825, 95% CI 1.139-2.957), laparoscopic approach (OR 1.943, 95 % CI 1.217-3.104) and increased length of initial stay (OR 1.155, 95% CI 1.090-1.225) were all associated with 30-day readmission. The most common reason for readmission was dehydration/ileus/partial bowel obstruction, with 10% of patients readmitted for this reason within 30 days.

Conclusions—Patients undergoing restorative proctocolectomy are at high risk for readmission, particularly following the first stage of the operation. Novel treatment pathways to prevent ileus and dehydration as an outpatient may decrease the rates of readmission following RP.

Keywords

Post-operative readmission; restorative proctocolectomy

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Introduction

In addition to negatively impacting patient quality of life, hospital readmissions dramatically increase cost. An estimated \$17 billion is spent annually on unplanned readmissions for Medicare patients alone [1]. At the same time, 30 day readmission rates are now being utilized as indicators of quality of care [2-4], and are directly linked to Medicare reimbursement [5]. Despite this, predicting which patients will be readmitted and preventing readmissions continues to be a challenge [6, 7].

A number of studies have examined readmission in general surgery patients. Some studies have found male sex and older age to be associated with increased risk of readmission, while others have implicated obesity, hospital length of stay, surgical site infections and steroid use as the most important predictors of readmission [4, 8-12]. In contrast, other studies have concluded that readmission cannot be predicted at all [13, 14].

While much has been written about hospital readmission in general, there is a paucity of data on readmission rates for patients with ulcerative colitis (UC) undergoing restorative proctocolectomy (RP). The aim of this study was to characterize patients with UC who underwent RP at our institution and evaluate and further define the following: 1) the timeframe of readmission, 2) the reason for readmission and 3) risk factors associated with readmissions. Due to the complexity of the procedure, we hypothesized that patients would be readmitted primarily following the first stage of RP and that the majority of readmissions would be due to gastrointestinal motility complications. Based on previous data from our institution [15], we also hypothesized that younger patients would be at greater risk for readmission.

Methods

Data Source

We performed a retrospective review of a prospectively-maintained institutional colorectal database. The database contains patients who underwent surgical treatment for UC at a single academic institution from 1/1998 to 5/2013. All investigations were approved by the University of Wisconsin-Madison Health Sciences Institutional Review Board and the Human Subjects Committee.

Patient Population

UC is an idiopathic inflammatory bowel disease for which definitive treatment often requires RP. RP at our institution is routinely performed as a 2-stage operation. During the first stage patients undergo proctocolectomy with double stapled ileal pouch creation and a diverting loop ileostomy, while takedown of the loop ileostomy is performed during the second stage.

Patients were included in the study if they underwent RP at our institution during the study time period, were at least 18 years old at the time of the procedure, and had sufficient follow-up to establish 30 and 90 day readmission statuses. Patients were not included if they had a diagnosis other than UC, had incomplete charts or were lost to follow-up, underwent

colectomy without ileal pouch creation, underwent reoperation for an existing pouch, or had another procedure not involving initial pouch creation. The creation of the ileal pouch was considered stage I for all analyzed patients. We identified 14 patients who underwent a 3 stage procedure, as well as 2 patients that underwent a single stage procedure in our database. We included patients who underwent single, two stage and three stage procedures together in our statistical analysis.

Perioperative Variables

Explanatory variables included age, sex, American Society of Anesthesiology (ASA) classification, diabetes, hypertension, laparoscopic approach, BMI, initial length of stay (LOS), operative time, and steroid use at the time of discharge. Patient age was stratified by quartiles in the following groups: <28.4 years, 28.4-39 years, 39-50 years, and 50+ years. BMI, LOS, and operative time were evaluated as continuous variables.

Outcomes

The primary outcome was postoperative readmission at 30 and 90 days. Incidents of at least one unplanned readmission were examined following both stage I and stage II of RP. In addition, the reason for readmission was examined. The following categories were included as possible reasons for readmissions: dehydration/ileus/partial small bowel obstruction (pSBO), complete small bowel obstruction (SBO, diagnosed intra-operatively or via imaging), infection (wound or organ space infection), anastomotic complication (bleeding, fistula or anastomotic leak), non-GI complication (cardiovascular, thrombotic, renal and oncologic) and other GI complication (pouchitis, cuffitis). All readmission diagnoses were determined by the admitting surgeon. Patients were included in the dehydration/ileus/partial/pSBO category if they were admitted for ileus/pSBO or for dehydration secondary to ileus/pSBO, high/low output ileostomy, nausea/vomiting, constipation, adrenal insufficiency, or combination of these diagnoses. The diagnosis of anastomotic leak was determined by the admitting provider in conjunction with radiologic evidence or return to the operating room.

Statistical Analysis

To evaluate for risk factors associated with readmission, Chi-squared analysis was performed for categorical variables while continuous variables were evaluated with independent student's t tests. A correlation matrix was used to assure that no collinearity existed amongst explanatory variables. Variables with p value <0.10 on univariate analysis were included in the multivariate model. Variables with less than 10 readmitted patients were excluded from multivariate analysis. Logistic regression analysis was used to determine independent predictors of 30 day readmission, as well as reason for readmission following stage I of RP. Significance for multivariate analyses was defined as p <0.05. All statistical analyses were performed using SPSS Gradpack v. 20.

Results

We identified 838 patients with UC who underwent RP between 1/1998 and 5/2013. After exclusion criteria were applied, our study population consisted of 533 patients (Figure 1). Figure 2 demonstrates 30 and 90 day readmission rates following RP. The majority of

readmissions occurred after stage I of RP, and occurred within 30 days of surgery. Therefore, we focused the remainder of our study on this group of patients.

Characteristics of patients who were or were not readmitted within 30 days of stage I are demonstrated in Table 1. Patient demographics significantly associated with 30 day readmission included female sex and younger age. Additionally, we found that laparoscopic operative approach and longer LOS were also associated with readmission. Patients who underwent laparoscopic surgery (n = 210) had a mean LOS of 6.7 ± 4.1 days, while patients who underwent open surgery (n = 323) had a mean LOS of 7.4 ± 3.6 days (p = 0.042).

The multivariable analysis evaluating risk factors for stage I readmission is demonstrated in Table 2. Younger patient age, longer LOS, and laparoscopic approach were all found to independently predict readmission in patients admitted within 30 days of stage I. Notably, there was no correlation between patient age and initial length of stay (r=0.028, p=0.519).

A similar analysis was performed to identify predictors of readmission patients following stage II RP. The only variable found to be significantly associated with readmission after stage II RP was ASA classification with a 8% readmission rate in patients with ASA class I, 7.6% in ASA class 2, and 18.6% in ASA class 3 (p=0.043). No variables were found to be independent predictors of readmission following stage II on multivariable analysis.

Reasons for 30 day stage I and stage II readmission are listed in Table 3. The most common reason for stage I readmission (10%) was dehydration/ileus/pSBO. Two thirds of patients with these diagnoses were discharged within 72 hours. The most common reason for stage II readmission was likewise dehydration/ileus/pSBO (4%), with approximately one third of these patients being discharged within 72 hours.

As demonstrated in Table 4, we then performed a multivariate analysis to evaluate risk factors associated with stage I readmission for gastrointestinal motility issues, defined as ileus, partial or complete bowel obstruction. We found that laparoscopic approach, age <39 and longer LOS were the strongest predictors of 30 day readmission in this group.

Discussion

The aim of this study was to evaluate hospital readmission rates in patients with UC who underwent RP, identify risk factors for readmission, and further characterize reasons for readmission in UC patients. We found that the majority of UC patients readmitted following RP were readmitted within 30 days following the first stage of the procedure. Independent predictors of readmission following stage II RP were younger age, longer LOS, and laparoscopic approach. We evaluated the causes of readmission, and found that gastrointestinal complications comprised nearly all readmissions. The strongest predictors of readmission for gastrointestinal complications were again younger age and laparoscopic approach.

Thirty day readmission following RP for UC was common (18.2%). As we hypothesized, bowel motility issues (ileus or bowel obstructions) or dehydration secondary to these issues accounted for the majority of readmissions, a finding consistent other studies. Previously,

Ozturk et al. found that in patients undergoing ileal pouch–anal anastomosis readmissions were primarily due to ileus/obstruction or serum electrolyte abnormalities (54% of all readmissions), although their overall readmission rate was slightly less than our institution at 12% [16]. Similarly, Datta et al. reported that small bowel obstruction alone accounted for 33% of readmissions following RP, with dehydration accounting for an additional 10% and a total readmission rate of 30% [17]. Interestingly, complete bowel obstructions were uncommon in our group, with most patients being readmitted for dehydration due to ileus or a partial obstruction and the majority of patients were discharged home within 72 hours. To our knowledge the timeframe to resolution of symptoms from bowel obstruction following RP has not previously been examined in UC patients.

Complications related to the anastomosis were the least common reason for readmission following both stage I and stage II RP. This may be due to the fact that almost all procedures were performed as a two stage operation. Conversely, this could indicate that anastomotic complications are uncommon in this patient population and RP may safely be performed as a single stage operation. There is recent controversy in the literature on this subject. Some authors have found an increased risk of life threatening complications and reoperation in patients who undergo single stage RP [18]. Patients on steroids have been found to be at particularly high risk for post-operative complications [19]. Others have found decreased complication rates following single stage RP along with the benefit of shorter length of hospital stay [20-23]. Published series on single stage RP have consisted of small numbers of patients with a focus on complications rather than post-operative readmissions, further studies are needed to determine if single stage RP is a safe alternative to a two stage procedure and to delineate reasons for readmission in patients following single stage RP.

With respect to risk factors, we found that younger age, increased LOS and a laparoscopic approach were associated with 30 day readmission following stage I RP. LOS and a laparoscopic approach were also risk factors for readmissions specifically due to gastrointestinal complications. To the authors, the finding that laparoscopic approach increased the risk of readmission was the most surprising. Laparoscopic RP has been shown not only to be as safe and effective as a traditional open approach, but also offers significant benefit, such as reduced length of stay and shorter recovery time [24]. At the same time, there have been reports of laparoscopic approach correlating with increased readmission rates in patients with a diverting ileostomy [25], as well as in patients undergoing RP with IPAA [16]. In fact, Ozturk et al. found laparoscopic approach to be predictive of readmission with an adjusted odds ratio nearly identical to our study [16]. To our knowledge, this is the only other study to show this association between laparoscopic approach and readmission following RP.

The tendency of readmitted patients, especially those readmitted with GI motility issues, to have relatively short hospital stays (<72 hours) raises the question of whether these readmissions may be preventable. Although ileus or a partial SBO may be the admitting diagnosis, dehydration appeared to be the most common presentation to emergency department and often resolved quickly with conservative treatment. As dehydration is often implicated as a primary cause for readmission in patients with an ileostomy [25], as well as UC patients undergoing RP with IPPA,[16] we speculate that early detection and treatment

of dehydration in the outpatient setting, could prevent readmissions in UC patients. To this extent we would suggest that protocolized perioperative teaching, such as the “Ileostomy pathway” which has been shown to reduce readmission rates in patients with new ostomies, would also likely be effective in our patient population.[26]

This study was limited by the use of patient data from a single tertiary referral center. While patients who underwent RP at our institution were not likely to be readmitted elsewhere without follow up due to the complexity of the initial procedure, a fraction of patients were lost to follow-up or had incomplete charts. The retrospective nature of this study made it difficult to assess the reason for readmission in patients with gastrointestinal motility issues. Admission notes frequently identified multiple reasons for readmission including dehydration, gastrointestinal motility issues, and adrenal insufficiency. A prospective study with strict diagnosis definitions may be better able to separate these diagnoses, however in reality patients are likely suffering from multiple issues related to gastrointestinal motility complications and therefore grouping these diagnoses is clinically appropriate. While preoperative steroid use was not found to be associated with readmission in this study, the database did not contain information on the use of biologics in these patients, which is a limitation to this study. In addition, patients under the age of 18 were excluded from this study. We estimate that pediatric patients comprise approximately 7% of the UC population at our institution. It would be difficult to extrapolate these results to pediatric patients.

Conclusion

In conclusion, patients undergoing RP are at high risk for readmission, particularly for GI related issues following the first stage of the operation. Novel treatment pathways to prevent ileus and dehydration as an outpatient may decrease the rates of readmission following RP. Given the high rate of readmission, as well as potentially preventable reasons for readmission, we believe this patient population would be an ideal group for targeted perioperative teaching and clinics aimed at identifying and managing post-operative complications early in an effort to decrease readmission rates. While fast track or enhanced recovery protocols have been developed in other colorectal patient populations, patients undergoing RP are not typically included in these programs. This patient population would likely benefit greatly from the standardized preoperative expectation setting, teaching regarding postoperative recovery, and standardized care that have these programs so successful in other patient populations.

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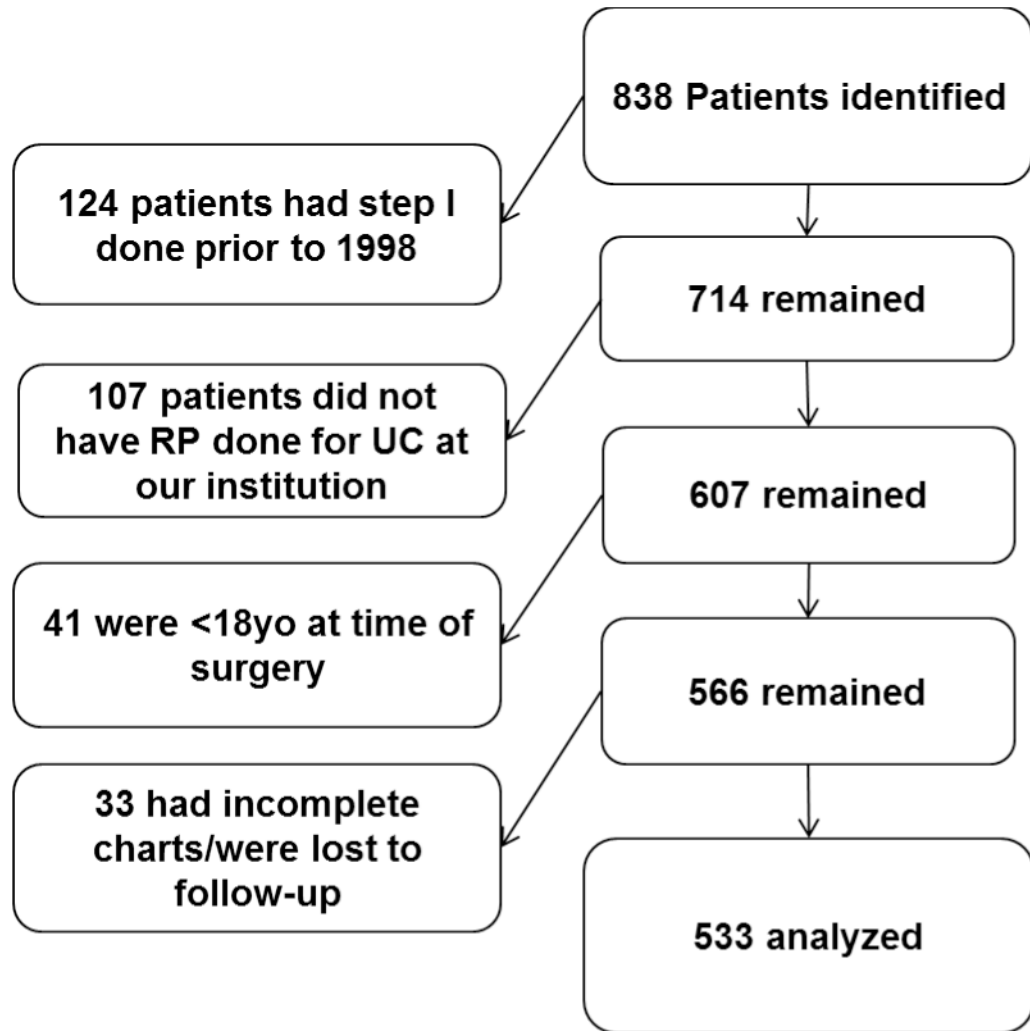


Figure 1. Summary of Study Population

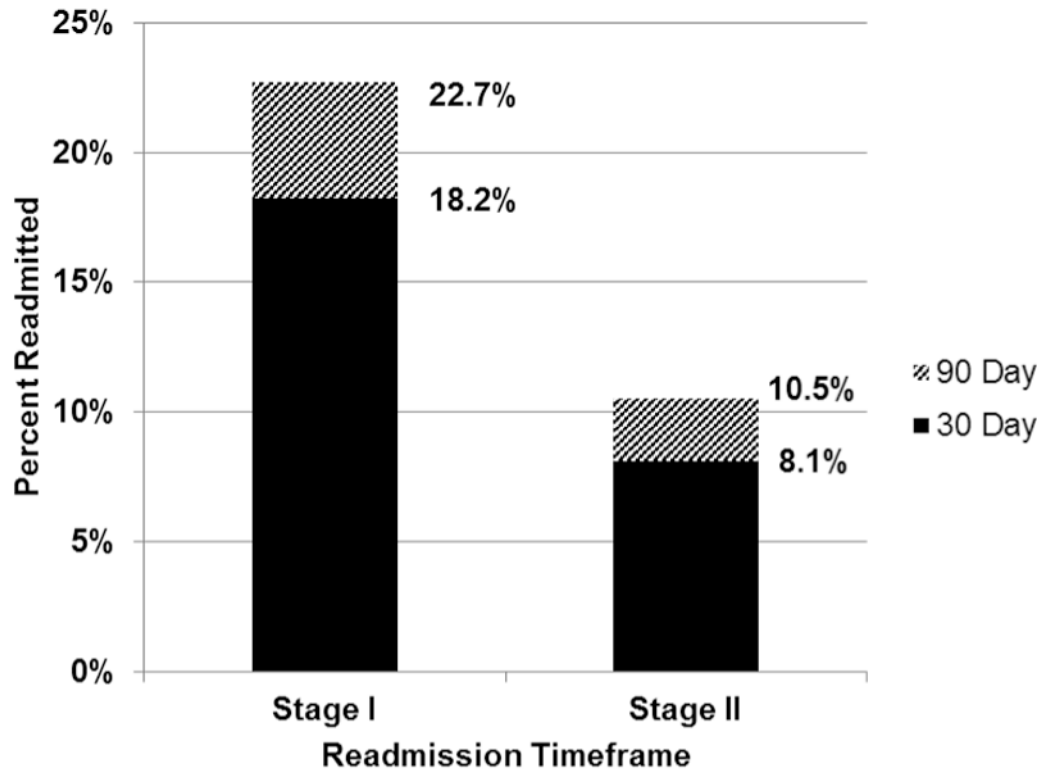


Figure 2. Readmission rates within 30 and 90 days of Stage I and Stage II RP

Table 1

Patient characteristics and risk factors for readmission within 30 days of stage I.

Characteristic		Readmitted within 30 days	Not readmitted within 30 days	P value
Sex	Male	46 (15%)	257 (85%)	0.025
	Female	51 (22%)	179 (78%)	
Age (quartile)	1st	34 (26%)	99 (74%)	0.017
	2nd	25 (19%)	108 (81%)	
	3rd	14 (11%)	119 (89%)	
	4th	24 (18%)	110 (82%)	
ASA	1	3 (10%)	26 (90%)	0.059
	2	85 (19%)	358 (81%)	
	3	4 (9%)	40 (91%)	
	Unknown	16 (89%)	2 (11%)	
Diabetes	Yes	5 (17%)	24 (83%)	0.63
	No	92 (18%)	408 (82%)	
	Unknown	0	4 (100%)	
Hypertension	Yes	13 (20%)	53 (80%)	0.938
	No	83 (18%)	379 (82%)	
	Unknown	1 (20%)	4 (80%)	
Operative Approach	Laparoscopic	50 (24%)	160 (76%)	0.005
	Open	47 (15%)	276 (85%)	
Discharge Steroids	Yes	65 (27%)	172 (73%)	0.139
	No	263 (89%)	33 (11%)	
BMI	Median 25.3	Mean 25.4	Mean 26.2	0.184
Length of Stay(days)	Median 6 days	Mean 9.1 days	Mean 6.7 days	<0.001
OR Time(minutes)	Median 380 mins	Mean 401 mins	Mean 391 mins	0.345

Table 2

Multivariable analysis of risk factors for stage I readmission within 30 days.

Risk Factor	Adjusted OR	95% CI	P-value
Sex (f)	1.461	0.982-2.412	0.131
Age <39 yrs.	1.825	1.139-2.957	0.013
Length of stay	1.155	1.090-1.225	<0.001
Laparoscopic approach	1.943	1.217-3.104	0.005

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Table 3

Reasons for 30 day readmission following stage I and II of RP.

Readmission Diagnosis	Stage I	Stage II
	N = 97* n (%)	N=43* n (%)
Dehydration/Ileus/pSBO	53 (55)	22 (51)
<72 Hours [†]	34 (35)	8 (18)
>72 Hours [†]	19 (20)	14 (33)
Complete SBO	14 (14)	2 (5)
Non-GI Issue	12 (12)	7 (16)
Infection	11 (11)	6 (14)
Other GI Issue	6 (6)	4 (9)
Anastomotic Issue	5 (5)	3 (7)

* A small number of patients were readmitted more than once, there were 101 readmissions in 97 patients **following stage I RP, and 44 readmission in 43 patients following stage II RP.**

[†] Length of stay upon readmission

Note -13 pts in stage II group were lost to follow up

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Table 4

Multivariable analysis of risk factors associated with 30 day readmission for GI motility issues following stage I of RP.

Risk Factor	Adjusted OR	95% CI	P-value
Sex (f)	1.303	0.759-2.236	0.338
Age (<39)	1.696	0.959-3.001	0.07
Length of Stay	1.104	1.041-1171	0.001
Laparoscopic approach	1.833	1.061-3.165	0.03
BMI	0.924	0.871-0.980	0.009
Steroids	1.452	0.807-2.611	0.214

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