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Postoperative readmissions following ileostomy formation among patients with a gynecologic malignancy☆

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Abstract

Objectives—Ileostomy results in a relatively poorer water reabsorption and is associated with dehydration and renal injury. These problems may be exacerbated in the setting of gynecologic cancers owing to both patient and disease-related factors. We evaluated the rate and reasons for hospital readmission within 30 days of ileostomy creation in patients with a gynecologic malignancy.

Methods—We performed a retrospective review of women with gynecologic malignancies who underwent ileostomy creation between 2002 and 2013.

Results—Fifty-three patients were eligible for analysis. The mean age was 63.3 years. Most patients had ovarian cancer (86.5%). Indications for ileostomy included small bowel obstruction (45.3%), as part of primary debulking (18.9%), or treatment of an anastomotic leak (15.1%). The 30-day readmission rate was 34%. Comorbid diseases such as hypertension ($p = 0.008$) and chronic kidney disease ($p = 0.010$) were more common among women who were readmitted. The most common reasons for readmission were dehydration (38.9%) and acute renal failure (33.3%); women readmitted for these conditions had higher average serum creatinine levels at initial postoperative discharge (1.00 mg/dL versus 0.71 mg/dL, $p = 0.017$) than women who did not require readmission. Readmitted women had a trend toward shorter overall survival (0.41 years versus 1.67 years, $p = 0.061$).

Conclusions—Readmission rates for gynecologic oncology patients undergoing ileostomy were similar to, but higher than those previously reported in the colorectal literature. In our population,

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Conflict of interest statement

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patients with preexisting cardio-vascular or renal disease were at the highest risk of readmission and may benefit from preemptive strategies to decrease high ostomy output and dehydration.

Keywords

Ileostomy; Readmission; Gynecologic malignancy

Introduction

The formation of an ileostomy is frequently required for women with gynecologic malignancies as part of primary debulking, following a tenuous anastomosis, or diversion for secondary complications such as bowel obstruction or fistula [1-3]. Though intra-operative morbidity of ileostomy formation is generally low, the changes in physiology, caused by shorter small bowel transit time and the relatively poorer water absorption resulting from bypassing the colon, have been shown in the colorectal population to cause dehydration or renal failure in up to 19.3% of patients. This in turn results in increased readmission rates (up to 35%), higher costs, and potential adverse impact on both quality and length of life [4,5].

Paquette et al. suggest that among a mixed group of patients treated on a colorectal surgery service (mean age 47 years), dehydration, renal failure, and readmission were associated with identifiable risk factors including older age and formation of ileal pouch anal anastomosis [6]. A similar study by Messaris et al. identified the use of postoperative diuretics, a measure of pre-existing renal dysfunction and a possible surrogate marker for advanced age, as predictive for readmission [5]. Both authors go on to suggest that attention to prognostic factors combined with prophylactic, outpatient medical interventions may reduce both the cost and morbidity of ileostomy management. In neither of the above studies was the impact of co-morbid disease discussed in detail.

Though informative, it is unclear to what degree these findings can be extrapolated to the gynecologic oncology patient population, who are generally older and more medically compromised, and whose pathophysiology may exacerbate dehydration. As increasing scrutiny is placed on the surrogate markers of surgical quality, such as readmission rates, we felt it was important to review our ileostomy outcomes in the setting of gynecologic malignancy in an effort to identify opportunities to optimize our post-operative care [8,9].

The objectives of this study were to examine the rates of readmission following ileostomy formation in women with gynecological malignancies at an academic-based gynecologic oncology service, and to determine the reasons for readmission.

Methods

After obtaining study approval by the Institutional Review Board at the University of Minnesota, we performed a retrospective chart review of all patients who underwent the creation of an ileostomy on the Gynecologic Oncology service at the University of Minnesota Medical Center between January 2002 and November 2013. Dates were chosen to correspond with a divisional database which was cross-referenced against the hospital

medical records using ICD-9 codes, and to allow for at least a 30 day post-operative window. A chart review was completed using the inpatient and outpatient electronic medical records to determine the incidence of readmission within 30 days after hospital discharge following surgery. All cases of readmission were documented, however planned readmission (e.g. for chemotherapy administration) was excluded from this study.

Clinical data abstracted included patient demographics, comorbid diseases, site of primary malignancy, International Federation of Gynecology and Obstetrics (FIGO) stage, and previous surgery and adjuvant therapies received. Intraoperative data collected were the indication for ileostomy, the type of ileostomy created (loop vs. end ileostomy), estimated blood loss, and other surgical procedures performed. Postoperative data collected included ileostomy output upon discharge, creatinine level upon discharge, other postoperative complications, length of initial stay, and reason for readmission. The time to readmission describes the interval between initial discharge and date of readmission.

We accepted the clinical diagnosis of dehydration and the Acute Kidney Injury Network definition of acute renal failure which includes any of the following: absolute increase in serum creatinine ≥ 0.3 mg/dL in a 48-h period, 1.5-fold increase in serum creatinine level in a 48-h period, or oliguria of ≤ 0.5 mL/kg for ≥ 6 h [10]. Change in creatinine was based on the difference between the discharge or ultimate inpatient creatinine and the last pre-operative creatinine, such that a negative number implied a decrease in serum creatinine following surgery.

Baseline characteristics of the women enrolled this study were summarized; number (n) and percent (%) or mean ± standard deviation (SD) are presented as appropriate unless otherwise noted. The association between patient characteristics and readmission to the hospital within 30 days of ileostomy was determined using Chi-squared and Fisher's Exact tests as appropriate for categorical data and t-tests and Wilcoxon rank sum tests as appropriate for continuous data. Overall survival (OS), defined as time from ileostomy creation to death or censorship if still alive at last follow-up or five years from surgery, was summarized using Kaplan-Meier methods. A comparison of OS by readmission to the hospital within 30 days of ileostomy was made using a log rank test. Additional comparisons among those readmitted were conducted by reason for hospital readmission. Due to small sample sizes, all comparisons were conducted using Fisher's Exact tests for categorical data and Wilcoxon rank sum tests for continuous data. Statistical analyses were performed using SAS 9.3 (SAS Institute, Cary, NC) and p-values of <0.05 were considered statistically significant.

Results

A total of 53 patients with gynecologic malignancies undergoing ileostomy formation were identified and met inclusion criteria for our study. Table 1 summarizes the characteristics of these patients. The mean age of the patients included was 63.3 years, which is more than a decade older than that reported in the colorectal literature [5,6]. The majority of patients had a diagnosis of ovarian cancer (86.5%), with uterine and cervical cancers accounting for 7.7% and 5.8%, respectively. Most patients had Stage III disease (66.0%) and had been

previously treated with a combination of surgery and chemotherapy (76.2%). Only 1 patient had received previous radiation therapy.

The median time from initial diagnosis of cancer to ileostomy formation was 7 months (range 0–365 months, Table 2). The indications for diversion were typical of a gynecologic oncology service and included small bowel obstruction, as part of primary debulking, treatment of bowel perforation/anastomotic leak, and protection of downstream anastomosis. The majority of patients had visible tumor at the time of surgery (74.0%). Ascites was present in 25.7% of patients. The median estimated blood loss was 100 mL (range 10–4000 mL). Mean change in creatinine from baseline to discharge was −0.12 ± 0.28 mg/dL. Though not available for all patients, median ostomy output at discharge was 688 mL/24 h (range 90–3405 mL), which is similar to that reported by Paquette et al. [6].

The 30-day hospital readmission rate was 34.0% for this population; the median time between hospital discharge and readmission was 11.5 days (range 4–26 days). The most common reasons for readmission were dehydration (38.9%) and acute renal failure (33.3%), (Table 3).

Comorbid conditions such as hypertension ($p = 0.008$), and chronic kidney disease ($p = 0.010$) were more prevalent in those patients who were readmitted (Table 2). The mean creatinine upon readmission was 2.14 ± 2.79 mg/dL. The mean creatinine at postoperative discharge was higher among patients who were readmitted in comparison with those patients who were not readmitted (0.92 ± 0.41 mg/dL versus 0.65 ± 0.22 mg/dL, $p = 0.016$; Fig. 1) but the mean change in creatinine was not significantly different ($p = 0.099$), supporting the hypothesis that pre-existing renal impairment may predictably exacerbate the physiologic changes associated with ileostomy. Median ostomy output on the day of discharge was 1,213 mL/24 h for patients who were readmitted and 550 mL/24 h for patients who were not readmitted. This difference did not reach statistical significance as these results were not available for all patients in the study. There was little difference in median ostomy output between patients admitted for renal failure/dehydration (1,213 mL/24 h) and other reasons for readmission (1,163 mL/24 h). All patients were treated with supportive medical care, chiefly intravenous hydration.

With a median follow-up of 1.1 years for all participants (1.8 years for survivors), 40 women had died within 5 years of surgery. Women who were readmitted following ileostomy experienced shorter overall survival compared with those women who were not readmitted (0.4 years vs. 1.7 years, $p = 0.061$, Fig. 2). The reason for death was available in only 9 patients; however, among these patients the most common reason for death was progression of disease, and no patients died from complications directly related to ileostomy formation.

We explored clinical characteristics specifically associated with readmission for dehydration or acute renal failure versus readmission for other reasons, though our sample size is small for these comparisons. Diuretic use appeared more common among patients readmitted for dehydration or acute renal failure, however, this finding was not statistically significant (30.8% versus 20%, $p = 1.00$). There was no formalized protocol for post-discharge

hydration or anti-motility agent use during the study period; however, we examined the frequency of use of these modalities among patients included in this study. Planned administration of outpatient intravenous fluids after discharge was less common among those inpatients readmitted for dehydration or acute renal failure compared to patients who were not readmitted (22.2% vs. 60.0%, p = 0.117), though this difference was not statistically significant. Postoperative use of anti-motility agents was similar among patients readmitted for dehydration or acute renal failure compared to patients who were admitted for other reasons (41.7% versus 40.0% p = 1.00).

Comorbid diseases, particularly chronic kidney disease and hyper-tension were up to three times more prevalent among patients who were readmitted (Table 1).

Discussion

Our data show that about one-third of gynecologic oncology patients at our institution are readmitted after ileostomy formation, and that a majority of readmissions are related to the development of dehydration or acute kidney failure. The distribution of previously described risk factors was similar to that reported in the colorectal literature, but the gynecologic oncology population appears older and the prevalence of predictive co-morbidities appears higher, likely contributing to the higher rate of readmission. While the mean creatinine at discharge was higher among patients who were readmitted but still within normal range, the range was not equal between the patients who were readmitted and not readmitted as demonstrated in Fig. 1, suggesting that higher creatinine levels at discharge should warrant closer outpatient monitoring to avoid readmission. Preemptive treatment with anti-motility agents and outpatient hydration was associated with lower rates of readmission, suggesting a potential role for an “ileostomy pathway” in gynecologic oncology patients to improve surgical quality and costs.

Our observed rate of readmission following ileostomy formation was comparable to that predicted by similar studies in the colorectal literature, which report rates of readmission of up to 40% [4-5, 11-18]. The median age of patients in the gynecologic oncology population is older than that of the patients in the colorectal populations reported; and previous studies from the colorectal literature have highlighted age as a risk factor for readmission [6]. Superimposed on chronic age-related renal impairment, large fluid shifts, as may occur following removal of ascites or the relief of obstruction, are associated with acute relative hypotension and resultant acute tubular necrosis. Likewise, the exact location of the ileostomy among gynecologic oncology patients is often dictated by the location of tumor (rather than optimal small bowel length), which potentially contributes to shorter proximal bowel length and higher ileostomy output.

We found that readmission after ileostomy was most strongly related to age, preexisting hypertension, and renal disease, especially readmission for dehydration or renal failure. These findings reflect those of Kariv et al. who found chronic disease as predictive of readmission [8]. Patients readmitted for dehydration or acute renal failure generally had similar ileostomy output at discharge (median 1,213 mL/24 h), however their creatinine level at discharge was significantly higher than patients who were not readmitted, indicating

that the change in physiology may not be as important as the presence of baseline renal compromise.

Patients readmitted for dehydration or acute renal failure were less likely to have been discharged with antiemetics and/or planned use of outpatient intravenous fluids, suggesting a potential benefit for preemptive management. Nagle et al. reported a small series of patients assigned to an “ileostomy pathway” which included preoperative teaching, active engagement of patients in ostomy care while in the hospital, and post-discharge tracking of intake and output and visiting nurse support [7]. These authors observed a 40% reduction in all-cause readmission rate (35.4% to 21.4%) as well as an elimination of readmission for dehydration from a baseline rate of 15.5%. For patients who demonstrate high ileostomy output near discharge, routine use of anti-motility agents and planned outpatient intravenous hydration after discharge should be considered. Additionally, for patients who use diuretics chronically, temporarily discontinuing these medications until ostomy output levels are decreased may lower the likelihood of developing dehydration. Though we were unable to demonstrate a relationship between the presence of ascites and readmission, it seems unlikely that prophylactic measures would be less important in patients with this additional risk of intravascular hypovolemia.

Readmission predicted a relatively poorer overall survival in our population. Whether readmission contributes to the demise of these patients or reflects a higher level of pre-intervention morbidity is unclear, however, we favor the latter explanation. Irrespective of the long term goals, our data suggest that optimizing both patient selection and post-operative management may be avenues to improving overall surgical quality.

To our knowledge, this is the first study to examine readmissions following ileostomy in women with gynecologic malignancies. Strengths include that the study population is sufficient in size to characterize the common findings and the study period is contemporary. The sample size was, however, insufficient to allow for meaningful subgroup comparisons and because these data are from one academic institution, the results may not be generalizable. There are multiple limitations inherent to retrospective studies including the potential for reporting bias and missing data points. There was no standard objective definition of dehydration; and while ileostomy outputs were available for most patients, oral intake and urinary output were not recorded after discharge, making the relative contributions of each more difficult to parse out.

In summary, we found that women with gynecologic malignancies who undergo ileostomy formation are readmitted at rates similar to but higher than reported in the colorectal literature. This finding may be related to a higher prevalence of the risk factors including advanced age and pre-existing renal compromise. Readmission was most commonly for dehydration or acute renal failure, which were predicted by known risk factors; and prophylactic use of outpatient hydration resulted in lower rates of readmission. Given that readmission was associated with shorter survival, these data suggest both patient and institutional benefits from instituting an “ileostomy pathway” for gynecologic oncology patients.

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HIGHLIGHTS

- We demonstrate readmission rates following ileostomy in women with gynecologic malignancies.
- Preexisting cardiovascular and renal disease predict readmission following ileostomy creation.

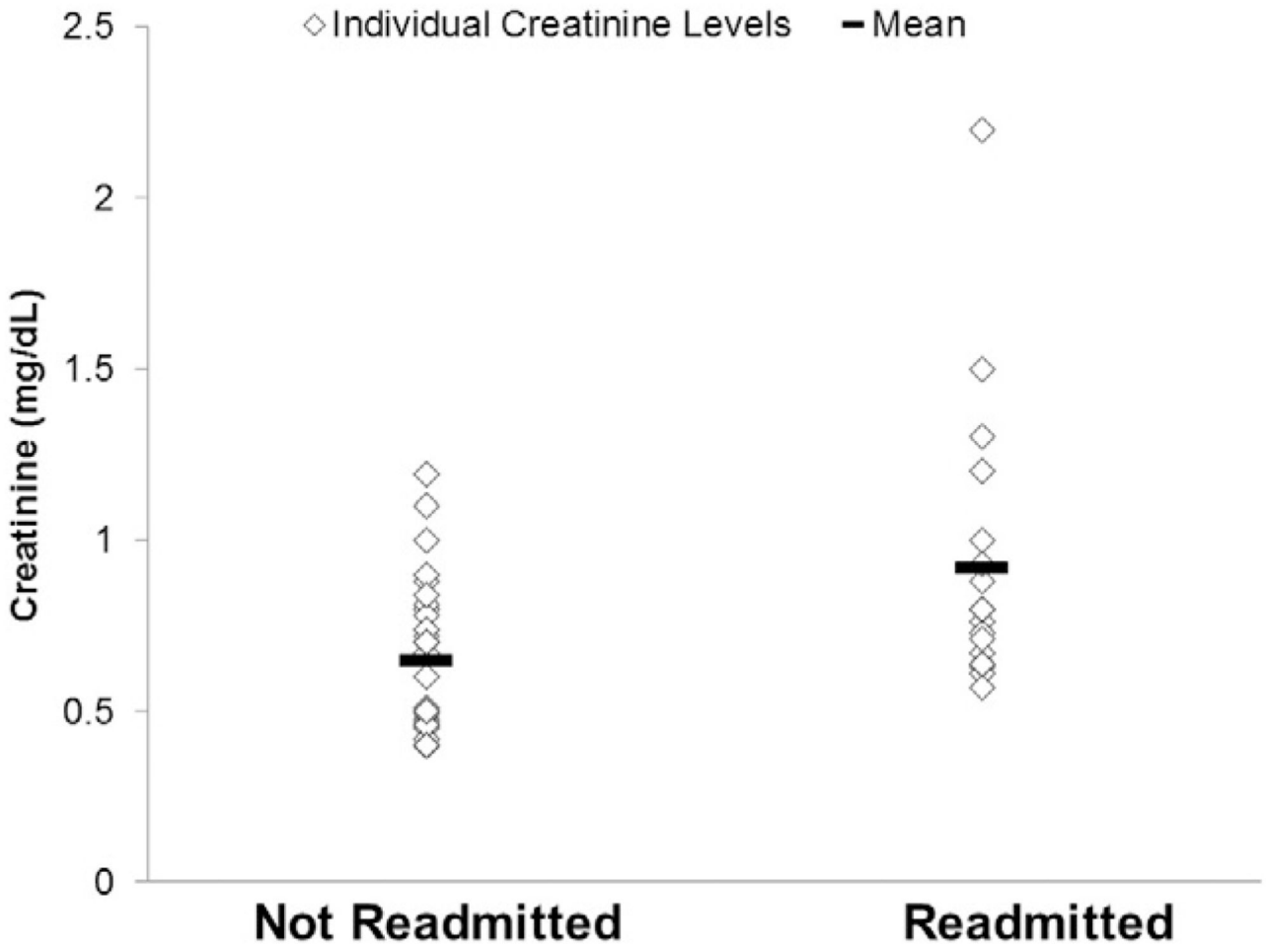

Fig. 1.
Comparison of range in discharge creatinine levels by readmission status.

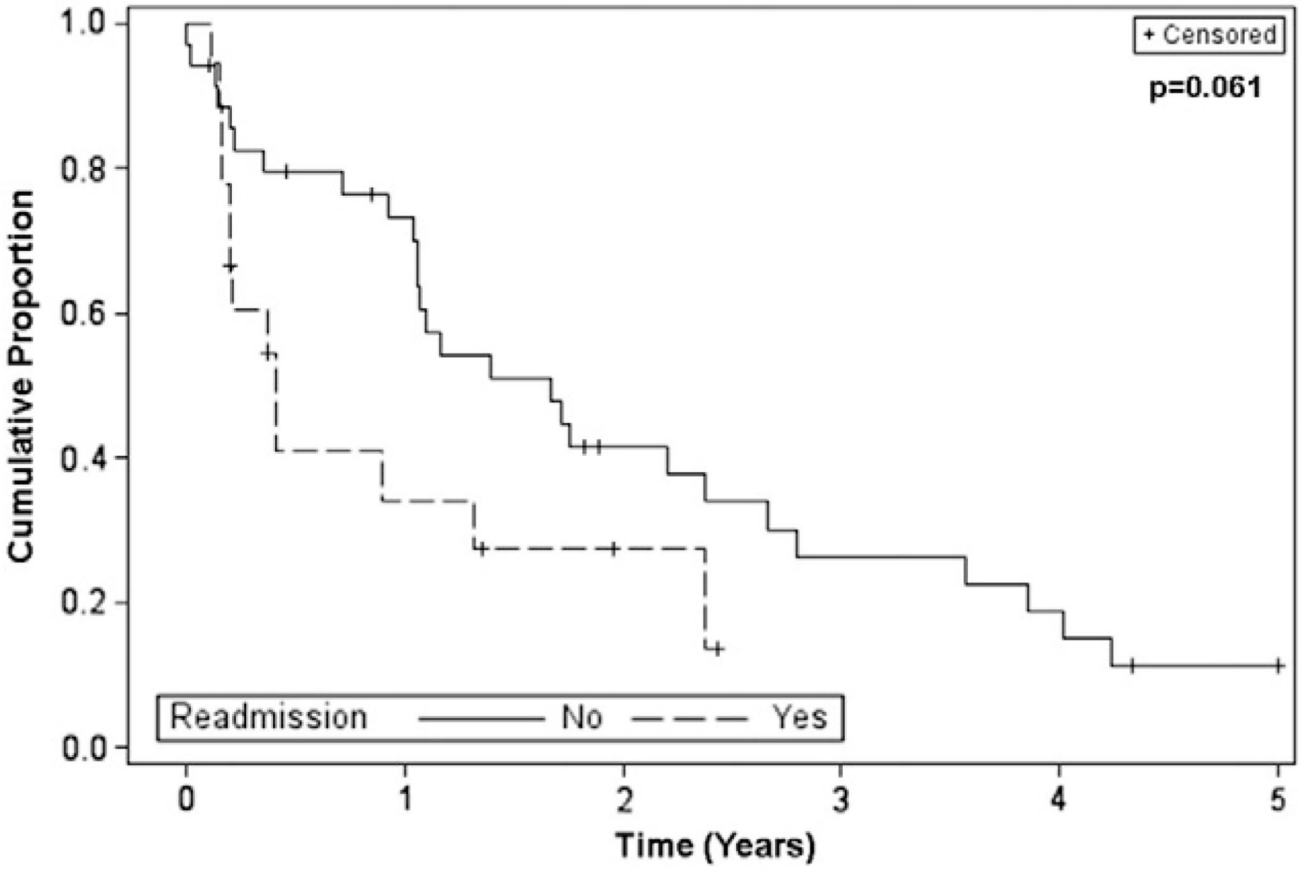

Fig. 2.
Comparison of overall survival by hospital readmission following ileostomy.

Table 1

Patient Characteristics by Readmission to Hospital within 30 days.

Variable	All Patients (N = 53) n (%)	Not Readmitted (N = 35) n (%)	Readmitted (N = 18) n (%)	p-value[1]
Age in years, mean (SD)	63.3 (11.3)	62.3 (11.0)	65.2 (12.0)	0.411
BMI, mean (SD), kg/m^2	25.6 (5.7)	25.5 (5.8)	25.7 (5.7)	0.886
Site of primary disease				0.304
Ovary	45 (86.5)	31 (91.2)	14 (77.8)	
Uterus	4 (7.7)	2 (5.9)	2 (11.1)	
Cervix	3 (5.8)	1 (2.9)	2 (11.1)	
Disease stage				0.244
I	3 (6.0)	2(6.1)	1 (5.9)	
II	2 (4.0)	0 (0.0)	2 (11.8)	
III	33 (66.0)	22 (66.7)	11 (64.7)	
IV	12 (24.0)	9 (27.3)	3 (17.7)	
Previous therapies				0.515
Surgery	5 (11.9)	4 (15.4)	1 (6.3)	
Surgery + chemotherapy	32 (76.2)	19 (73.1)	13 (81.3)	
Chemotherapy alone	4 (9.5)	3 (11.5)	1 (6.3)	
Chemotherapy + XRT	1 (2.4)	0 (0.0)	1 (6.3)	
History of CKD				0.010
No	49 (92.5)	35 (100.0)	14 (77.8)	
Yes	4 (7.6)	0 (0.0)	4 (22.2)	
History of diuretic use				0.478
No	42 (79.3)	29 (82.9)	13 (72.2)	
Yes	11 (20.8)	6(17.1)	5 (27.8)	
History of hypertension				0.008
No	31 (58.5)	25 (71.4)	6 (33.3)	
Yes	22 (41.5)	10 (28.6)	12 (66.7)	
History of diabetes				0.108
No	49 (92.5)	34(97.1)	15 (83.3)	
Yes	4 (7.6)	1 (2.9)	3 (16.7)	
Use of postoperative anti-motility agent				0.361
No	26 (66.7)	16 (72.7)	10 (58.8)	
Yes	13 (33.3)	6 (27.3)	7 (41.2)	
Use of outpatient IVF				0.442
No	24 (72.7)	15 (79.0)	9 (64.3)	
Yes	9 (27.3)	4(21.1)	5 (35.7)	
Discharge location				0.082
Home	27 (60.0)	19 (70.4)	8 (44.4)	
TCU	18 (40.0)	8 (29.6)	10 (55.6)	

Variable	All Patients (N = 53) n (%)	Not Readmitted (N = 35) n (%)	Readmitted (N = 18) n (%)	p-value[1]
Administration of postoperative TPN				0.759
No	24(51.1)	14 (48.3)	10 (55.6)	
Inpatient only	18 (38.3)	11 (37.9)	7 (38.9)	
Discharge	5 (10.6)	4(13.8)	1 (5.6)	

BMI, body mass index; XRT, radiation therapy; CKD, chronic kidney disease; IVF, intravenous fluid; TCU, transitional care unit; TPN, total parenteral nutrition.

Table 2

Perioperative Characteristics.

Variable	All Patients (N = 53) N (%)	Not Readmitted (N = 35) N (%)	Readmitted (N = 18) N (%)	p-value[1]
Time from primary diagnosis to Ileostomy, median (range), months	6.9 (0-365)	6.7 (0-73)	7.9 (0-365)	0.181
Presence of disease				0.741
No	13 (26.0)	8 (24.2)	5 (29.4)	
Yes	37 (74.0)	25 (75.8)	12 (70.6)	
Presence of ascites				1.00
No	26 (74.3)	16 (72.7)	10 (76.9)	
Yes	9 (25.7)	6 (27.3)	3 (23.1)	
Indication for ileostomy				0.430
Small bowel obstruction	24 (45.3)	16 (45.7)	8 (44.4)	
Bowel perforation	7 (13.2)	6(17.1)	1 (5.6)	
Anastomotic leak	8 (15.1)	5 (14.3)	3 (16.7)	
Primary debulking	10(18.9)	7 (20.0)	3 (16.7)	
Other	4 (7.6)	1 (2.9)	3 (16.7)	
Type of ileostomy				0.061
Loop ileostomy	38(71.7)	28 (80.0)	10 (55.6)	
End ileostomy	15(28.3)	7 (20.0)	8 (44.4)	
Length of postoperative stay, median (range), days	10(4-46)	10(4-46)	9(4-29)	0.543
Creatinine level, preoperative, mean (SD), mg/dL	0.88 (0.45)	0.81 (0.37)	0.99 (0.56)	0.253
Creatinine level, discharge, mean (SD), mg/dL	0.75 (0.33)	0.65 (0.22)	0.92(0.41)	0.016
Difference between preoperative and discharge creatinine level, mean (SD), mg/dL	−0.12(0.28)	−0.16 (0.31)	−0.07(0.21)	0.099
Readmission creatinine, mean (SD), mg/dL			2.14 (2.79)	

Table 3

Reasons for readmission.

Reason	N (%)
Dehydration	7 (38.9%)
Acute renal failure	6 (33.3%)
Ileus/Small bowel obstruction	2 (11.1%)
Other	3 (16.7%)