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ORIGINAL ARTICLE – COLORECTAL CANCER

Psychiatric Illness is a Disparity in the Surgical Management of Rectal Cancer

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ABSTRACT

Background. Psychiatric disorders are common in the US and represent a major health disparity but little is known about their impact on surgical management and outcomes in cancer.

Objective. The aim of this study was to determine whether rectal cancer patients with psychiatric diagnoses have fewer sphincter-preserving procedures and higher postoperative complications.

Methods. Overall, 23,914 patients from the Nationwide Inpatient Sample (NIS) who underwent surgery for rectal cancer from 2004 to 2011 were identified. Patients with comorbid common psychiatric diagnoses were identified by International Classification of Diseases, Ninth Revision (ICD-9) codes. Main outcomes were measured by operation performed, length of stay (LOS), postoperative complications, and discharge disposition.

Results. Twenty percent of patients had a psychiatric diagnosis, with substance use being the most common psychiatric disorder (63 %). Patients with psychiatric diagnoses were more likely to be younger, White, have lower income, and have Medicaid insurance ($p < 0.001$) than those without. In a logistic regression model, patients with any psychiatric diagnosis were less likely to have sphincter-sparing surgery, controlling for patient sociodemographics, Charlson score, hospital procedure volume, and year (odds ratio 0.77; 95 % CI 0.72–0.83). LOS and postoperative complications were similar among the cohorts. Patients with psychiatric disorders were more likely to have home health care at discharge ($p < 0.001$).

Conclusions. Fewer sphincter-sparing procedures were performed on rectal cancer patients with psychiatric diagnoses. However, no significant differences in postoperative complications were observed.

Despite major advances in early detection and treatment of colorectal cancer, it remains the third most deadly cause of cancer-related death in the US.[1] The treatment of rectal cancer, in particular, often involves complex psychosocial issues as the need for multimodality treatment and the chances of needing a colostomy are highest. Surgery remains the mainstay in its treatment approach. Sphincter-sparing procedures are preferred, when feasible, over traditional abdominoperineal resection (APR), and are associated with higher patient satisfaction.[2]

Several factors have been shown to affect the rate of sphincter-sparing procedures, with hospital procedure and surgeon volumes being amongst the most cited.[2,3] Racial and socioeconomic status disparities have been described in the presentation, treatment, and outcomes of colorectal cancer, and have likewise been correlated with lower rates of sphincter-sparing procedures.[2,4–9] Identifying potential disparities in the treatment of rectal cancer patients is crucial to develop an understanding of the complex pathways involved and, ultimately, improve care for all patients. Psychiatric disorders represent an often overlooked, but important, health disparity.

Psychiatric disorders are very common in the US, affecting over one-quarter of the adult population. It is estimated that half of all adults will receive at least one psychiatric diagnosis during their lifetime.[10] They account

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for more disability in developed countries than any other group of illnesses, including cancer and heart disease.[11] As a result, mental health disparities are receiving increased attention, and have been named among the top four topics requiring immediate national attention by the Federal Collaboration on Health Disparities Research.[12] Despite this, little is known about their impact on surgical management and outcomes in cancer. The limited existing data have shown that psychiatric disorders are associated with delays in cancer diagnosis, poor adherence to standard treatment regimens, and increased overall and cancer-related mortality.[13,14] However, little is known about the impact of psychiatric comorbidities in colorectal cancer. The only study that has explored their role in colon cancer focused on elderly patients with dementia.[13] Identification of psychiatric comorbidities as a potential disparity and/or risk factor for poor outcomes in rectal cancer provides the opportunity to appropriately modify screening and treatment approaches in this group of patients.

In this study, which is the first of its kind, we aimed to determine if the presence of a psychiatric comorbidity impacts the surgical treatment for rectal cancer, and to test the hypothesis that they are associated with higher frequencies of stoma construction and postoperative complications.

METHODS

We reviewed the Nationwide Inpatient Sample (NIS) database from 2004 to 2011. The NIS is the largest all-payer inpatient care database in the US, and is based on a 20 % stratified sample of non-federal hospital admissions.[15] It is a public de-identified database, therefore Institutional Review Board approval was requested and subsequently waived.

All patient admissions with the diagnosis of rectal cancer (primary admission diagnosis International Classification of Diseases, Ninth Revision codes 154.1 and 154.8) were identified. Patients were included if they had an operation for rectal cancer during their admission. Surgery for rectal cancer was defined as 'APR' (codes 48.5, 48.50, 48.51, 48.52), 'low anterior resection' [LAR] (code 48.63), or 'LAR with colostomy' (code 48.62). Procedures undertaken laparoscopically were identified by add-on codes (54.21, 54.51).[16] Transanal excision (codes 48.3, 48.35, 48.36) was initially included; however, given the small number of patients undergoing this procedure, in addition to the inability to determine cancer-directed surgery versus biopsy, these were not included for analysis. Patients undergoing other procedures were also not included. Patients with rectosigmoid cancer (154.0) were excluded because it was perceived that these patients would have received sphincter-preserving procedures. Likewise, patients with anal cancer (154.2, 154.2) were excluded to avoid confusion in diagnoses and surgical management. Sphincter-preserving procedure was defined as LAR. LAR with colostomy was grouped with the APR patients for the purpose of comparison with the sphincter-salvage patients.

Patients with comorbid psychiatric diagnoses were identified by ICD-9 codes, according to the Diagnostic and Statistical Manual, 4th Edition (DSM-IV-TR).[17] Participants with the following most common axis-I psychiatric diagnoses were identified: anxiety disorders, mood disorders, schizophrenia and other psychotic disorders, and substance abuse and dependence disorders (Electronic Supplementary Table 1). Personality disorders and somatoform disorders were included initially; however, the number of patients with these diagnoses was very small ($N = 5$ and $N = 0$, respectively) and they were therefore not included in additional analyses. These diagnoses were chosen in consultation with expert opinion. Dementia was not included as this has been well-studied.[13,18]

Sociodemographic characteristics, including age, sex, race, income by zip code, and payer type were also obtained from the NIS database. Comorbidity scores were calculated from ICD-9 codes, based on a Charlson score modification.[19] Admission type was classified as elective or non-elective, as coded within the NIS. Hospital factors, including bed size (small, medium, and large, as defined by NIS), location (rural, urban), teaching status (teaching, non-teaching), and rectal cancer procedure volume per year (1–5, 6–10, 11–20, >20) were also obtained.

Outcome Measures

Main outcome measures were type of operation performed, length of stay (LOS), postoperative complications, and discharge disposition, as classified by the NIS database. Postoperative complications were identified by ICD-9 code and included anastomotic leak (997.49), wound infection (998.59), intra-abdominal abscess (567.22), infected post-operative seroma (998.51), wound dehiscence (998.31, 998.32), urinary tract infection [UTI] (595.0, 996.64, 997.5), pulmonary complications, including pulmonary embolus and pneumonia (415.11, 997.31, 997.32, 997.39), deep venous thrombosis [DVT] (451.11, 451.19, 451.2, 451.81, 451.82, 451.83, 451.84, 451.89, 451.9, 453.4, 453.41, 453.42, 997.2), and postoperative myocardial infarction (997.1, 410.0–410.9, 998.0).

Statistical Analysis

Summary statistics were used to describe the study population.

Univariable analyses (using Wilcoxon rank-sum tests and Pearson's Chi square tests) were used to identify potential differences in treatment and outcomes between the two cohorts. We constructed a multivariable logistic regression model to examine the relationship between the presence of any psychiatric diagnosis and sphincter-preserving procedure. We also constructed a second multivariable model that broke down psychiatric diagnoses into five categories (anxiety disorders, mood disorders, schizophrenia/psychotic disorders, substance abuse, or multiple diagnoses). These models were adjusted for sex, age, race, income, insurance, Charlson comorbidity score, hospital procedure volume, and year of admission. The models and summary statistics incorporated the hierarchical sampling structure of the NIS. Two-sided p values were used, and p values lower than 0.05 were considered to be statistically significant. All statistical analyses were performed using R version 3.1.3[20] and the survey package.[21]

RESULTS

A total of 23,890 patients who underwent surgery for rectal cancer between 2004 and 2011 were identified. Of these, 4862 (20.4 %) had a comorbid psychiatric diagnosis. Table 1 shows the sociodemographic characteristics of the cohorts. Patients with psychiatric diagnoses were more likely to be younger, White, have income in the lower two quartiles, and have Medicaid insurance. No difference in the comorbidity score, type of admission, or hospital characteristics was observed. Substance use disorders were the most common among those with any psychiatric diagnosis (63 %), and most patients with a psychiatric comorbidity had a single diagnosis (89 %) (Fig. 1).

LAR (sphincter preservation) was performed in 50.7 % of patients, APR in 39.5 % of patients, and LAR with colostomy in 9.8 % of patients. LAR was performed laparoscopically in 2.9 % of cases, APR was performed laparoscopically in 4.1 % of cases, and LAR with colostomy was performed laparoscopically in 0.3 % of cases. Patients with any psychiatric disorder were less likely to have sphincter preservation (48 vs. 52 %; $p < 0.001$) and, similarly, were more likely to have an APR (2125 or 44 vs. 7314 or 38 %; $p < 0.001$). The proportion of LARs with colostomy was the same in both groups (502 or 10 vs. 1842 or 10 %; $p = 0.178$). LOS and postoperative complications were similar among the cohorts (Table 2). Patients with psychiatric disorders were less likely to have 'routine'

TABLE 1 Sociodemographic, clinical characteristics, and hospital factors of rectal cancer patients

	No psychiatric diagnosis ($N = 19{,}051$)	(+) Psychiatric comorbidity ($N = 4863$)	p value
Mean age ± SD (years)	64 ± 13.2	61 ± 12.3	<0.001[a]
Sex (% female)	41 %	40 %	0.064[b]
Race			<0.001[b]
White	78 %	83 %	
Black	8 %	7 %	
Hispanic	7 %	6 %	
Asian or Pacific Islander	4 %	2 %	
Native American	1 %	1 %	
Other	3 %	2 %	
Income by zip code			<0.001[b]
Lowest two quartiles	50 %	54 %	
Highest two quartiles	51 %	46 %	
Insurance			<0.001[b]
Medicare	47 %	40 %	
Medicaid	5 %	11 %	
Private (including HMO)	43 %	42 %	
Other	5 %	7 %	
Type of admission			0.401[b]
Non-elective	13 %	13 %	
Elective	87 %	87 %	
Charlson Comorbidity Score			0.678[b]
1	0 %	0 %	
2	46 %	45 %	
3	19 %	19 %	
4+	36 %	36 %	
Hospital location			0.232[b]
Rural	8 %	9 %	
Urban	92 %	91 %	
Teaching status			0.468[b]
Non-teaching	43 %	43 %	
Teaching	57 %	57 %	
Hospital bed size			0.862[b]
Small	10 %	10 %	
Medium	22 %	22 %	
Large	68 %	68 %	
Hospital case volume			<0.032[b]
1–5	25 %	25 %	
6–10	20 %	21 %	
11–20	26 %	27 %	
>20	30 %	28 %	

SD standard deviation, *HMO* health maintenance organization

[a] t test

[b] Chi square test

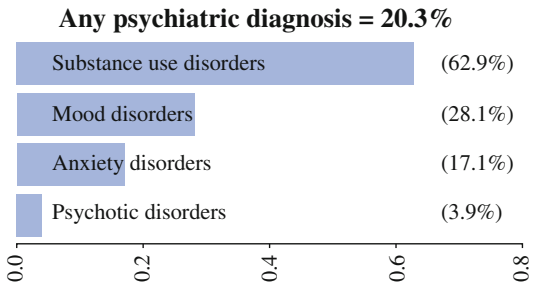

FIG. 1 Distribution of Specific Axis I DSM-IV diagnoses

TABLE 2 Postoperative outcomes in patients with rectal cancer

	No psychiatric diagnosis ($N = 19{,}051$) (%)	(+) Psychiatric comorbidity ($N = 4863$) (%)	p value
Postoperative complications (any)	22	23	0.587[a]
Anastomotic leak	13	12	0.512[a]
Wound infection (any type)	5	6	0.520[a]
Intra-abdominal abscess	1	1	0.704[a]
Infected seroma	0	0	0.499[a]
'Postoperative' wound infection	5	5	0.452[a]
Wound dehiscence	1	2	0.054[a]
UTI	2	3	0.334[a]
Pneumonia	2	3	0.263[a]
DVT	1	1	0.557[a]
MI	3	3	0.551[b]
Median LOS	7	7	0.067[b]
Discharge disposition			<0.001[a]
Routine[c]	49	46	
Home health care	38	41	
Transfers/other	13	13	

UTI urinary tract infection, *DVT* deep venous thrombosis, *MI* myocardial infarction, *LOS* length of stay

[a] Chi square test

[b] Wilcoxon rank-sum test

[c] Routine discharge = discharge to home or self-care

discharge (46 vs. 49 %) and were more likely to have home health care at discharge (41 vs. 38 %; $p < 0.001$).

In the multivariable analysis, significant predictors of sphincter preservation included younger age, female sex, Asian/Pacific Islander race, income level in the highest two quartiles, private insurance status, and hospitalization occurring in hospitals with procedure volume greater than ten cases per year (Table 3). The presence of any psychiatric diagnosis was a significant negative predictor of sphincter preservation (odds ratio [OR] 0.77, CI 0.72–0.83; $p < 0.001$). In an additional multivariable model, which broke down psychiatric diagnoses into four categories, we found that mood disorder (OR 0.70, CI 0.60–0.81; $p < 0.001$), schizophrenia/psychotic disorders (OR 0.64, CI 0.42–0.98; $p = 0.038$), substance use disorders (OR 0.81, CI 0.74–0.90; $p < 0.001$), and multiple psychiatric diagnoses (OR 0.64, CI 0.52–0.79; $p < 0.001$) were each negative predictors for sphincter preservation (Table 4). Anxiety disorders were not significantly associated with less sphincter preservation after adjustment (OR 0.89, CI 0.73–1.07; $p = 0.22$). Given the high frequency of substance use disorder as a psychiatric diagnosis, the multivariable analyses were repeated, excluding substance use disorder, and resulted in similar results.

DISCUSSION

To our knowledge, this is the first study reporting that patients with pre-existing psychiatric diagnoses present a real health disparity when it comes to the surgical management of rectal cancer. We tested the hypothesis that rectal cancer patients with psychiatric comorbidities have differences in surgical treatment and higher postoperative complications. We found that 20 % of rectal cancer patients had a comorbid psychiatric diagnosis, which is consistent with the reported US incidence of psychiatric disorders.[10] Psychiatric disorders are known to be associated with low socioeconomic status, which was corroborated by our findings.[12] Surprisingly, postoperative complications and LOS were similar among the cohorts. Patients with psychiatric disorders were more likely to have home health care at discharge. Younger age, female sex, Asian/Pacific Islander race, income in the highest two quartiles, private insurance, and hospital procedure volume >10 cases/year were predictive factors for sphincter preservation. These factors have likewise been shown to correlate with sphincter preservation in the literature.[2–4,6] Even after controlling for these confounding factors, the presence of comorbid psychiatric diagnoses was an independent negative predictor for sphincter-preserving surgery.

The decision for sphincter preservation is complex. The height of tumor in the rectum determines the feasibility for a sphincter-preserving procedure. Neoadjuvant treatment has challenged the limitation for establishing intestinal continuity, allowing a 1 cm distal margin as an adequate oncologic resection.[22,23] As a result, increasing rates of sphincter preservation have been noted worldwide.[2,4,24] However, it is important to note that neoadjuvant treatment is logistically complex, requiring daily visits to treatment centers for many weeks, and the whole process of treatment

TABLE 3 Multivariable model addressing confounding factors for sphincter preservation

Variable	OR (95 % CI)	*p* value
Age[a]	0.99 (0.99–0.99)	<0.001
Female sex	1.18 (1.11–1.25)	<0.001
Race (vs. White)		
Black	0.81 (0.72–0.92)	0.001
Hispanic	1.12 (0.98–1.27)	0.087
Asian or Pacific Islander	1.20 (1.01–1.43)	0.044
Income (vs. lowest quartile)		
Second lowest quartile	1.00 (0.91–1.09)	0.967
Second highest quartile	1.12 (1.03–1.23)	0.012
Highest quartile	1.24 (1.12–1.36)	<0.001
Charlson comorbidity score (vs. 2)[b]		
3	0.99 (0.91–1.07)	0.811
4+	1.03 (0.96–1.10)	0.447
Insurance (vs. Medicare)		
Medicaid	0.58 (0.50–0.68)	<0.001
Private	1.20 (1.09–1.31)	<0.001
Other payer	0.81 (0.70–0.94)	0.006
Hospital procedure volume (>10/year) (vs. <10 cases/year)	1.13 (1.03–1.25)	0.010
Year[a]	1.00 (0.98–1.02)	0.956
Urban hospital (vs. rural)	1.11 (0.96–1.27)	0.155
Teaching hospital (vs. non-teaching)	0.96 (0.88–1.06)	0.412
Medium bed size (vs. small)	1.00 (0.86–1.15)	0.965
Large bed size (vs. small)	1.01 (0.98–1.02)	0.899

OR odds ratio, *CI* confidence interval, *CCI* Charlson Comorbidity Index

[a] Age and year as continuous variables

[b] All patients had a minimum CCI of 2 due to cancer status

TABLE 4 Sphincter preservation in patients with rectal cancer with and without comorbid psychiatric disorders

Variable	Percentage of patients with diagnosis with sphincter preservation	Unadjusted OR (95 % CI)	Unadjusted *p* value	Adjusted OR[a] (95 % CI)	Adjusted *p* value
No psychiatric diagnosis	52	Reference		Reference	
Psychiatric diagnosis (any)	46	0.79 (0.74–0.84)	<0.001	0.77 (0.72–0.83)	<0.001
Anxiety disorder	48	0.90 (0.77–1.04)	0.134	0.89 (0.73–1.07)	0.218
Mood disorder	45	0.78 (0.70–0.87)	<0.001	0.70 (0.60–0.81)	<0.001
Schizophrenia/psychotic disorder	34	0.50 (0.36–0.68)	<0.001	0.64 (0.42–0.98)	0.038
Substance USE Disorder	46	0.80 (0.74–0.86)	<0.001	0.81 (0.74–0.90)	<0.001
Multiple psychiatric diagnosis (>1)	42	0.83 (0.69–1.00)	0.053	0.64 (0.52–0.79)	<0.001

OR odds ratio, *CI* confidence interval

[a] Adjusted for age, sex, race, Charlson score, income, payer type, hospital volume/location/teaching status, year

and reconstruction can take nearly a full year, which may be difficult for patients with psychiatric comorbidities. The decision to establish intestinal continuity, even if technically feasible and oncologically sound, requires additional consideration. In a coloanal anastomosis, the risk of postoperative incontinence, fecal urgency, frequency, and clustering significantly alter quality of life, which may be even more challenging in patients with psychiatric diagnoses and limited financial and social resources. Although the individual surgeon ultimately decides on the type of

procedure performed, the reasoning behind the decision is not captured in any database. We hypothesize that surgeon bias, lack of patient compliance to treatment regimens, including neoadjuvant therapy, and poor patient postoperative social support are likely contributing factors, all of which have been supported by the literature.[12–14,25]

We found that patients with psychiatric comorbidities did not have increased postoperative complications or LOS. This is surprising, given the reported increase in morbidity and mortality seen in patients with psychiatric disorders.[11–14] One explanation may be that the complications evaluated in this study were only immediate and postoperative and are therefore underrepresentative of overall complications. In this study, data gathered included inpatient information without cost of hospitalization, readmission data, or long-term outcomes (either overall or cancer-specific survival). Most of the increased morbidity and mortality noted in patients with psychiatric disorders are reported as long-term outcomes—oncologic outcomes, overall survival, and cancer-specific survival.[11–14]

An important limitation of this study is that the height of tumor in the rectum is not captured in the NIS database. However, we would not expect the level of tumor to differ in the two cohort groups. Additionally, the NIS database provides neither staging nor neoadjuvant treatment information. It is shown that patients with psychiatric comorbidity present at later stages,[13,14] which may result in higher diversion-type procedures, including colostomies and ileostomies; however, later stages should not impact the frequency of sphincter preservation procedures performed.[4] Lastly, no database accounts for surgeon discretion or patients' social support status, which are essential components of the surgical treatment of rectal cancer.

Racial and socioeconomic disparities are well accepted as factors that influence the rate of surgical intervention, type of surgery performed, and overall survival in rectal cancer.[4–8, 26] We demonstrate in this study that psychiatric disorders may be an unrecognized disparity that deserve further consideration in rectal cancer.[12] The presence of comorbid psychiatric diagnoses in rectal cancer calls for a multidisciplinary team, including the involvement of mental health providers in preoperative evaluation and planning, as well as in the perioperative and postoperative periods. Many mental illnesses can be managed successfully, and increasing the use of appropriate mental health treatment services could substantially reduce associated disparities and poor health outcomes.[10] Several recent studies have shown positive results after implementation of psychiatric symptom screening in oncologic settings with management by trained cancer nurses and psychiatrists.[27,28] The American College of Surgeons' Commission on Cancer is phasing in psychosocial distress screening in 2015, requiring all participating hospitals to implement screening on a routine basis.[29] In a recent article by Mehta and Roth, several clinical screening tools were recommended, including the Distress Thermometer, the Patient Health Questionnaire for Depression, and the Hospital Anxiety and Depression Scale.[30] Depending on the practitioners' level of comfort treating mental health conditions, and/or expertise/training of support staff, patients may be managed in the oncology setting or referred to psychiatric specialists.

CONCLUSIONS

This study highlights the complexity of decision making for sphincter preservation in patients with rectal cancer, presenting a disproportionate rate of sphincter-preserving procedures in patients with psychiatric disorders. There is a demonstrated need for education of health care providers to recognize possible biases in surgical decision making and ensure appropriate multidisciplinary screening and planning is implemented to improve care for all rectal cancer patients. Future studies are needed to assess whether the presence of psychiatric comorbidities affects the long-term outcomes in rectal cancer.

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