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Sexual function remains persistently low in women after treatment for colorectal cancer and anal squamous cell carcinoma

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Abstract

Background: Women diagnosed with colorectal cancer (CRC) or anal squamous cell carcinoma (ASCC) are at high risk of sexual dysfunction after treatment, yet little is known about recovery and risk factors for chronic dysfunction.
Aim: We aimed to describe sexual function and sexual activity among women who underwent definitive treatment for CRC or ASCC, examine relationships between time since treatment completion and sexual function, and explore factors associated with desire and changes in sexual desire over time.
Methods: As part of a prospective cohort study of patients with gastrointestinal cancer at the University of California San Francisco, female-identifying participants who finished definitive treatment for CRC or ASCC completed the Female Sexual Function Index (FSFI) at 6- to 12-month intervals. We used multivariable linear mixed models to explore factors associated with the FSFI desire subscale.
Outcomes: Outcomes were rates of sexual activity, proportion at risk for sexual dysfunction (FSFI score <26.55), total FSFI score, and FSFI desire subscale.
Results: Among the 97 cancer survivors who completed at least 1 FSFI, the median age was 59 years, the median time since treatment end was 14 months, and 87% were menopausal. Fifty-five women (57%) had a history of colon cancer; 21 (22%), rectal cancer; and 21 (22%), ASCC. An additional 13 (13%) had a current ostomy. Approximately half the women were sexually active (n = 48, 49%). Among these 48 sexually active women, 34 (71%) had FSFI scores indicating risk for sexual dysfunction. Among the 10 sexually active women who completed a FSFI ≥2 years since end of treatment, the median total score was 22.6 (IQR, 15.6-27.3). None of the evaluated characteristics were associated with desire (age, tumor site, treatment, menopause status, or ostomy status).
Clinical Implications: Consistent with prior studies, we found low desire scores after treatment for CRC or ASCC, with little recovery over time, suggesting that patients should not expect an eventual rebound of sexual function.
Strengths and Limitations: Strengths of our study include longitudinal data and use of the validated FSFI. Women with ASCC composed 22% of our cohort, allowing for insight into this rare disease group. Limitations of this study include the small sample size, particularly for longitudinal analyses, and the enrollment of patients at variable times since treatment end.
Conclusion: We observed a high prevalence of sexual health concerns, including low desire, after the treatment of CRC and ASCC that persisted for years after treatment was completed.

Keywords: female sexual dysfunction; cancer survivorship; colorectal cancer; anal squamous cell carcinoma; pelvic radiation; female hypoactive desire disorder.

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Introduction

Women who have been treated for cancers of the distal gastrointestinal tract (eg, colon, rectal, anal) are at high risk of sexual dysfunction after treatment,[1] and sexual health is a key tenet of survivorship care. More than 760 000 women are living in the United States after a diagnosis of colorectal cancer (CRC).[2] This number is projected to increase by 2040,[3] which is partially driven by the increasing incidence of CRC among adults younger than 50 years.[4] Although anal squamous cell carcinoma (ASCC) is rare, incidence is increasing in the United States, particularly among women.[5] Therefore, there is a growing population of women who undergo treatment for CRC or ASCC who will live large parts of their adult lives with treatment-related sequalae. There have been few studies either describing the trajectory of sexual dysfunction after treatment for CRC or ASCC or identifying modifiable risk factors for sexual dysfunction.

Definitive treatments for CRC and ASCC vary according to disease site and stage. Patients may receive pelvic radiation, chemotherapy, and/or surgery. Sexual dysfunction after these treatments is multifactorial, including tissue changes related to treatment and psychological distress related to cancer or treatment sequelae. In women, pelvic radiation and chemotherapy may disrupt gonadal function, precipitating genitourinary syndrome of menopause and lowering ovarian androgen production.[6] Additional sequelae related to pelvic radiation include vaginal stenosis, anal sphincter dysfunction and associated fecal incontinence, pain, and bowel habit changes. Resection of CRC can involve a temporary or permanent ostomy, resulting in changes in bowel habits, which can cause distress. In addition to pelvic anatomy and hormonal changes, survivors often experience body image distress, which is associated with low sexual desire after treatment for CRC and ASCC.[7,8]

While a high prevalence of sexual health concerns among CRC and ASCC survivors has been replicated in cross-sectional analyses, there are limited longitudinal data to demonstrate the expected trajectory of sexual functioning after treatment end.[9–13] In particular, longitudinal studies of sexual function after ASCC treatment have been limited by small sample sizes. The only studies of longitudinal, dedicated sexual health measures in ASCC to date are as follows: a report of 2 sexual health questions among 46 women and 26 men treated with radiation for ASCC,[14] a study that administered the Female Sexual Function Index (FSFI) to 15 patients with CRC or ASCC (not reported by tumor type),[15] and a comparison of patients with gastrointestinal or breast cancer that included 1 patient with ASCC.[9] Prior work on sexual health after CRC and ASCC has been limited by the inclusion of a significant percentage of participants who were not sexually active, thereby limiting the applicability of the FSFI. Several past analyses of sexual health after CRC or ASCC treatment have utilized 1 to 4 sexual health questions as part of a larger quality-of-life questionnaire rather than multidimensional sexual health measures such as the FSFI.[12,16]

We conducted this study to address this gap in the literature. Our aims were to (1) describe sexual function and sexual inactivity among women who underwent definitive treatment for CRC or ASCC, (2) examine relationships between time since treatment end and sexual function, and (3) explore factors associated with desire and changes in desire over time. The desire subscale was the focus of our analysis, as this domain is best able to be studied among women who are not sexually active, as compared with subscales such as pain and lubrication, which are contingent on sexual activity. We analyzed factors associated with the desire subscale among sexually active participants first and then among all participants regardless of sexual activity.

Methods

Eligibility and recruitment

The Lifestyle and Outcomes After Gastrointestinal Cancer (LOGIC) is an ongoing prospective cohort study of gastrointestinal cancer survivors initiated in 2017 at the Helen Diller Family Comprehensive Cancer Center, University of California San Francisco (UCSF). Individuals seen at UCSF for any gastrointestinal cancer malignancy are recruited by mail, telephone, or messaging through the electronic medical record or in the Gastrointestinal Oncology Survivorship Clinic. Additionally, paper invitations are periodically mailed to people with an eligible diagnosis in the UCSF Cancer Registry who do not have accounts for electronic messages via the electronic medical record. To be eligible for LOGIC, participants must be ≥18 years of age, have a gastrointestinal cancer diagnosis, and be able to complete online surveys in English. Participants for this analysis were enrolled between February 2017 and November 2020 and were followed through February 2021.

Participants in LOGIC were eligible for this analysis if they had undergone treatment for colon cancer, rectal cancer, or ASCC; if they identified as cis- or transgender female; and if they completed at least 1 sexual health questionnaire or 1 sexual health–related item on a quality-of-life questionnaire prior to February 2021. There was no limit on the length of time between diagnosis or treatment end and enrollment. We restricted this analysis to patients with CRC and ASCC given the risk of sexual dysfunction associated with pelvic radiation and colorectal surgery. Of 141 women with CRC or ASCC who consented to participate in the LOGIC cohort study by February 2021, 44 (31%) did not complete the FSFI.

Assessments

Participants in the LOGIC study receive secure online questionnaires every 6 months for 5 years through REDCap (research electronic data capture).[17] At varying intervals, questionnaires solicit information related to demographics, diet, physical activity, fertility, medical and smoking history, fear of cancer recurrence, sexual health, quality of life, psychological well-being, and sleep quality. Clinical characteristics, including tumor type, disease stage, treatments received, and disease recurrence status, are extracted from the medical record at enrollment and updated annually. Menopause status for women younger than 53 years was gathered through chart review of menstrual patterns after completion of oncologic treatment. Women aged ≥53 years were presumed to be menopausal based on 2017-2018 National Health and Nutrition Examination Survey data in which the median onset of menopause in US women was 49.6 years (IQR, 46.4-52.5).[18]

For this analysis, we used sexual function data collected at study enrollment and 6- and 18-month follow-up with the FSFI, a 19-item questionnaire that has been validated to assess risk for sexual dysfunction in cancer survivors.[19] The

FSFI generates domain scores for desire, arousal, lubrication, orgasm, satisfaction, and pain in addition to a full scale score (range, 7.2-36).[20] The FSFI questionnaire requires recall of recent sexual activity and is validated for use among women who have had sexual activity within the last 4 weeks. Participants completing the FSFI were asked a yes/no question, "In the past 4 weeks, did you engage in any sexual activity or intercourse?" without specific definition of the types of sexual activity. Conventionally, a cumulative FSFI score <26.55 indicates risk for sexual dysfunction,[21] and a desire domain score ≤5 (range, 1.2-6) indicates risk for hypoactive sexual desire disorder.[22]

Sexual health questions developed by the European Organization for Research and Treatment of Cancer Quality of Life Group to assess issues commonly experienced by patients with CRC (EORTC QLQ-CR29)[23] and ASCC (EORTC QLQ-ANL27)[24] were also administered at enrollment and every 6 months as part of the validated cancer-specific quality-of-life scales. The validated disease-specific questionnaires include 5 to 7 questions pertaining to sexual health. These questions are different between the EORTC QLQ-CR29 and QLQ-ANL27, based on studies of pertinent sexual health issues with different cancers.

Statistical analyses

We present summary statistics as medians with IQR to describe the study population at enrollment. Median FSFI scores are also reported cross-sectionally by time since treatment end, including repeat measurements if participants completed surveys at >1 time point (enrollment, 6-month follow-up, or 18-month follow-up). Sample size was not prospectively determined as this was a secondary analysis of available data in an open cohort study.

We used multivariable linear mixed models to explore factors associated with the FSFI desire subscale in questionnaires at study entry and follow-up. Time since treatment end, age at study entry, primary tumor site (colon, rectum, or anus), treatment modalities (surgery, radiation, and systemic treatment), menopause status, and presence of ostomy were evaluated as potential predictors of the FSFI desire score in separate models. To improve fit of the multivariate models, time since treatment end was modeled with cubic splines with 5 nodes.[25] Each model was adjusted for primary cancer site and time since end of treatment hierarchical modeling, including a random effect at the individual level. Missing data were assumed to be missing at random.[26] Statistical significance was declared at a 2-sided P value <.05. All analyses were performed with Stata Statistical Software (release 17; StataCorp). The data set for these analyses was locked as of February 2021.

Results

Participant characteristics

Ninety-seven women met inclusion criteria with a median age of 59 years (IQR, 52-68) and at a median 14 months (IQR, 4-31) since the end of oncologic treatment (Table 1). Of 141 women with CRC or ASCC who were enrolled in the larger LOGIC cohort study by February 2021, 44 (31%) did not complete the FSFI and therefore were not eligible for this analysis. Forty-eight sexually active women completed the FSFI at least once, 25 at ≥2 time points, and 13 at ≥3 time points. Regarding tumor type, 57% had a history of colon cancer; 22%, rectal cancer; and 22%, ASCC. Twenty-five percent of participants identified as part of a non-White racial group and 9% as Hispanic or Latina, and 63% were married at study enrollment. All participants with a history of ASCC, 95% of those with rectal cancer, and 78% with colon cancer were postmenopausal following completion of treatment. Among patients with colon cancer, 60% had received systemic therapy in addition to resection. Among patients with rectal cancer, 57% had received radiation in addition to surgery and/or systemic treatment. Among patients with ASCC, 95% had received radiation and systemic therapy. Thirteen percent of participants had a current ostomy at the time of study enrollment, and 12% had a previously reversed ostomy. For participants with a history of rectal cancer, 43% had a current ostomy and 43% had a previously reversed ostomy at time of study enrollment.

Disease-specific sexual health questions

Participants expressed significant concern around body image: 15% of colon cancer survivors and 33% of rectal cancer survivors reported that they felt "very much" or "quite a bit" less attractive as a result of their disease or treatment, and 22% of colon cancer survivors and 48% of rectal cancer survivors reported having "very much" or "quite a bit" of body dissatisfaction (Table 2). The most common symptoms cited by ASCC survivors were vaginal dryness (56%), vaginal narrowing (63%), and dyspareunia (33%) (Table 3).

FSFI scores

Of 97 participants, 48 (49%) reported that they had engaged in sexual activity or intercourse at least 1 time in the 4 weeks prior to enrollment questionnaire completion. At study enrollment, the median FSFI desire score among sexually active women was 3.0 (IQR, 2.4-3.6); 34 (71%) respondents had FSFI scores indicating risk for sexual dysfunction (total score <26.55).

FSFI scores analyzed cross-sectionally by time since completion of treatment demonstrated a median total score of 21.8 (IQR, 18.5-28.7) within the first year following treatment completion and 22.6 (IQR, 15.6-27.3) ≥2 years since the end of treatment (Table 4). Median desire scores indicated a risk for hypoactive sexual desire disorder (desire score <5) at all time points and for all tumor types (Figure 1). At ≥2 years since the end of treatment, median FSFI scores by tumor type were 23.5 for colon cancer, 22 for rectal cancer, and 17 for anal cancer (Table 4).

Associations of desire and change of desire over time

Most scores for desire fell between 2.4 and 3.6, and there was no clear monotone trend since end of treatment. In separate linear mixed models evaluating factors associated with desire scores, adjusted for time since treatment end, none of the evaluated characteristics (age, tumor site, treatment, menopause status, or ostomy status) were associated with outcomes related to desire among patients who reported being sexually active (Table 5). Similar multivariate models generated for all FSFI respondents regardless of recent sexual activity demonstrated an inverse relationship between age and desire score (estimated difference in desire scale, −0.1; 95% CI, −0.2 to 0.0; $P = .03$) and an association between postmenopausal status and lower desire (estimated difference in

Table 1. Clinical and demographic characteristics of 97 female participants in the LOGIC cohort: 2017-2020.[a]

Characteristic	All	Colon	Rectum	Anus
All	97	55 (57)	21 (22)	21 (22)
Age at study entry, y	59 [52-68]	56 [51-68]	57 [51-63]	63 [61-70]
Time from diagnosis to enrollment, y	1.7 [0.9-3.3]	1.6 [3.5-0.7]	2.1 [1.1-3.2]	1.3 [1.0-2.8]
Race/ethnicity				
Asian	11 (11)	9 (16)	2 (10)	0
Black	1 (1)	1 (2)	0	0
Hispanic or Latino	9 (9)	8 (15)	1 (5)	0
Multiple	2 (2)	1 (2)	1 (5)	0
Native American	1 (1)	1 (2)	0	0
White	71 (73)	33 (60)	17 (81)	21 (100)
Unknown	2 (2)	2 (4)	0	0
Marital status				
Married	61 (63)	33 (60)	16 (76)	12 (57)
Divorced/separated	19 (20)	11 (20)	2 (10)	6 (29)
Widowed	3 (3)	2 (4)	1 (5)	0
Never married	14 (14)	9 (16)	2 (10)	3 (14)
Body mass index, kg/m^2	25 [21-29]	25 [21-30]	26 [23-27]	23 [20-31]
Menopause status at time of enrollment				
Premenopausal	9 (9)	9 (16)	0	0
Menopausal	84 (87)	43 (78)	20 (95)	21 (100)
Unknown	4 (4)	3 (5)	1 (5)	0
Stage at diagnosis				
I	15 (15)	7 (13)	3 (14)	5 (24)
II	22 (23)	16 (29)	2 (10)	4 (19)
III	49 (51)	27 (49)	13 (62)	9 (43)
IV	6 (6)	3 (5)	1 (5)	2 (10)
Unknown	4 (4)	2 (4)	2 (10)	1 (5)
Years since last treatment				
<1	43 (44)	24 (44)	9 (43)	10 (48)
1-2	20 (21)	11 (20)	4 (19)	5 (24)
2-3	13 (13)	8 (15)	4 (19)	1 (5)
>3	21 (22)	12 (22)	4 (19)	5 (24)
Treatment				
Surgery	78 (80)	55 (100)	19 (90)	4 (19)
Radiation	32 (33)	0	12 (57)	20 (95)
Systemic therapy	72 (74)	33 (60)	19 (90)	20 (95)
Ostomy status				
Current ostomy	13 (13)	3 (5)	9 (43)	1 (5)
Ostomy previously reversed	12 (12)	2 (4)	9 (43)	1 (5)
No current or prior ostomy	44 (45)	27 (49)	3 (14)	14 (67)
Unknown	28 (29)	23 (42)	0	5 (24)

Abbreviation: LOGIC, Lifestyle and Outcomes After Gastrointestinal Cancer. [a]Data are presented as No. (%) or median [IQR].

Table 2. Sexual health among 76 female colorectal cancer survivors at enrollment in LOGIC.[a]

Survivor group: questions	Not at all	A little	Quite a bit	Very much	Unknown
Colon cancer					
Have you felt physically less attractive as a result of your disease or treatment?	28 (51)	19 (35)	2 (4)	6 (11)	0
Have you been feeling less feminine as a result of your disease or treatment?	38 (69)	7 (13)	2 (4)	6 (11)	2 (4)
Have you been dissatisfied with your body?	22 (40)	21 (38)	5 (9)	7 (13)	0
Rectal cancer					
Have you felt physically less attractive as a result of your disease or treatment?	9 (43)	5 (24)	1 (5)	6 (29)	0
Have you been feeling less feminine as a result of your disease or treatment?	11 (52)	5 (24)	2 (10)	3 (14)	0
Have you been dissatisfied with your body?	8 (38)	3 (14)	6 (29)	4 (19)	0

Abbreviation: LOGIC, Lifestyle and Outcomes After Gastrointestinal Cancer. [a]Data are presented as No. (%).

desire scale, −1.1; 95% CI, −1.8 to −0.5; $P = .001$) (Table 6). There were no significant associations between desire scores and primary tumor site, ostomy status, or treatment type.

Discussion

In this longitudinal cohort of 97 women who completed definitive treatment for CRC or ASCC, approximately half reported recent sexual activity, and >70% of those were at risk for sexual dysfunction. In this cohort, the median FSFI score among women <1 year out from finishing treatment was 21.8, as opposed to a mean 30.8 in control populations[21] and 18.5 among a survey of breast cancer survivors.[27] When FSFI scores were examined cross-sectionally by time interval since treatment completion, median total FSFI scores remained low beyond 2 years since treatment end. Our finding of persistently low FSFI scores over time since treatment completion is consistent with 3 longitudinal studies of CRC,

Table 3. Sexual health among 17 female anal cancer survivors at enrollment in LOGIC.[a]

Questions	Not at all	A little	Quite a bit	Very much	Unknown
Have you been sexually active?	10 (59)	6 (35)	1 (6)	0	0
To what extent have you been interested in sex?	6 (35)	11 (65)	0	0	0
Has the disease or treatment affected your sex life (for the worse)?	5 (31)	3 (19)	6 (38)	2 (13)	1 (6)
Have you had pain during intercourse?	8 (53)	2 (13)	1 (7)	4 (27)	2 (13)
Has your vagina felt dry?	3 (19)	4 (25)	5 (31)	4 (25)	1 (6)
Has your vagina felt narrow/tight?	2 (13)	4 (25)	6 (38)	4 (25)	1 (6)
Has your vagina been painful?	6 (38)	7 (44)	1 (6)	2 (13)	1 (6)

Abbreviation: LOGIC, Lifestyle and Outcomes After Gastrointestinal Cancer. [a]Data are presented as No. (%).

Table 4. Total FSFI over time since treatment end among 48 women who were sexually active at enrollment.[a]

	Time since treatment end					
	<1 y		1 to <2 y		≥2 y[b]	
FSFI full scale by primary tumor	No.	Median [IQR]	No.	Median [IQR]	No.	Median [IQR]
Cancer						
Colon	12	24.6 [19.7-32.4]	4	30.0 [18.1-31.6]	10	23.5 [20.3-27.3]
Rectal	5	20.1 [14.6-28.7]	3	26.5 [23.9-28.6]	3	22.0 [8.4-27.6]
Anal	6	21.8 [18.5-26.4]	3	20.5 [13.9-22.3]	2	17.0 [13.8-20.1]
FSFI scales, all tumor types						
Full scale	23	21.8 [18.5-28.7]	10	23.3 [18.2-29.1]	15	22.6 [15.6-27.3]
Desire		3.0 [2.4-3.6]		3.0 [2.4-3.6]		2.4 [2.4-3.0]
Arousal		4.5 [2.7-5.4]		4.2 [3.6-4.8]		3.8 [3.0-4.8]
Lubrication		4.2 [2.4-5.1]		4.1 [2.4-5.4]		3.9 [1.5-5.1]
Orgasm		5.2 [4.4-6.0]		5.2 [3.8-6.0]		4.6 [3.2-5.2]
Satisfaction		4.4 [3.2-5.6]		4.4 [2.8-5.6]		4.0 [2.0-5.2]
Pain		4.4 [3.2-6.0]		3.6 [2.4-6.0]		5.2 [4.4-5.8]

Abbreviation: FSFI, Female Sexual Function Index. [a]Includes repeat measurements for 25 participants who completed surveys at >1 time point. [b]Four participants had an assessment between 2 and 3 years (median FSFI, 24.3), and 11 had an assessment at ≥3 years (median FSFI, 22.6).

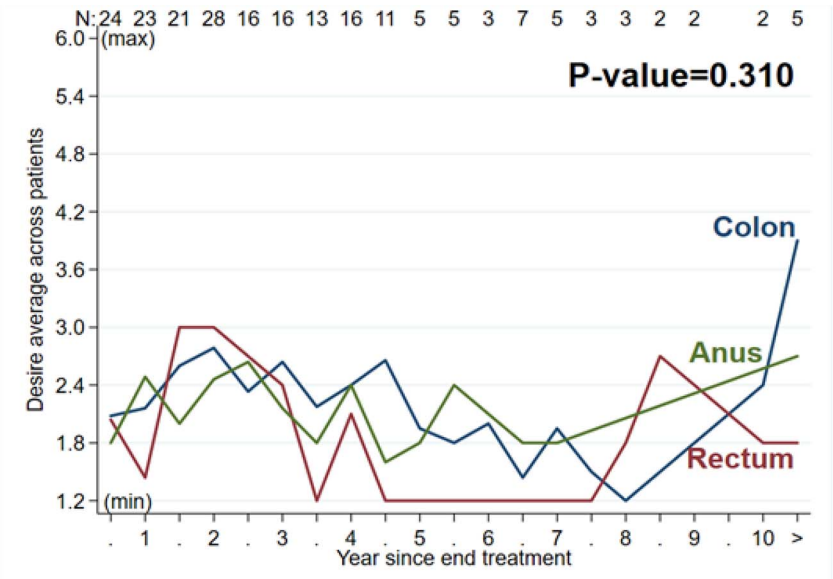

Figure 1. Mean desire scores among sexually active women, over time since treatment end, by tumor type. Linear mixed model compares mean desire scores among participants with different tumor primary sites (colon, rectum, or anus), adjusted for time since treatment end.

each including 75 to 311 female patients, which demonstrated significant deterioration of sexual function after surgery with stable to worsened sexual function over the 5 years after surgery.[10,12,13,28]

We found that body image was a concern especially among rectal cancer survivors, with 48% of CRC survivors reporting body dissatisfaction and 33% feeling less attractive related to cancer or treatment, either "quite a bit" or "very much." Rates of significant body image concerns were lower in colon cancer survivors, with 22% indicating body dissatisfaction and 15% feeling "quite a bit" or "very much" less attractive. Among rectal cancer survivors, 24% reported feeling less

Table 5. Associations of demographic and clinical factors with FSFI desire subscale among sexually active participants at enrollment (n = 48).[a]

Model: characteristic	Estimated difference (95% CI)[b]	*P* value
A: Age		
Age enrollment (5-y increments)	0 (−0.2 to 0.1)	.79
B: Tumor site		
Colon	Reference	
Rectum	−0.7 (−1.4 to 0.1)	.07
Anus	−0.3 (−0.9 to 0.4)	.46
C: Surgery		
No surgery	Reference	
Surgery	0.7 (−0.9 to 2.2)	.40
D: Radiation		
No radiation	Reference	
Radiation	−0.5 (−1.6 to 0.5)	.31
E: Systemic treatment		
No systemic treatment	Reference	
Systemic treatment	−0.1 (−0.8 to 0.6)	.73
F: Menopausal status		
Premenopausal	Reference	
Menopausal	−0.6 (−1.4 to 0.2)	.13
G: Ostomy status		
No current ostomy	Reference	
Current ostomy	−0.5 (−1.3 to 0.3)	.23

Abbreviation: FSFI, Female Sexual Function Index. [a]Separate models were examined for each predictor variable. All models were adjusted for time since treatment via cubic splines. Models A and C-G were also adjusted for primary tumor site. *P* values were calculated per the Wald test or likelihood ratio test. [b]Estimated difference in FSFI desire subscale attributed to exposure.

Table 6. Associations of demographic and clinical factors with FSFI desire subscale among participants regardless of sexual activity (n = 89).[a]

Model: characteristic	Estimated difference (95% CI)[b]	*P* value
A: Age		
Age enrollment (5-y increments)	−0.1 (−0.2 to −0.01)	.03
B: Tumor site		
Colon	Reference	
Rectum	−0.3 (−0.8 to 0.2)	.29[c]
Anus	−0.4 (−0.9 to 0.2)	.17[c]
C: Surgery		
No surgery	Reference	
Surgery	0.4 (−0.6 to 1.3)	.48
D: Radiation		
No radiation	Reference	
Radiation	−0.1 (−1.0 to 0.7)	.81
E: Systemic treatment		
No systemic treatment	Reference	
Systemic treatment	−0.3 (−0.8 to 0.2)	.26
F: Menopausal status		
Premenopausal	Reference	
Menopausal	−1.1 (−1.8 to −0.5)	.001
G: Ostomy status		
No current ostomy	Reference	
Current ostomy	−0.3 (−0.8 to 0.3)	.36

Abbreviation: FSFI, Female Sexual Function Index. [a]Separate models were developed for each predictor variable. All characteristics are adjusted for time since treatment via cubic splines. Models C-E were adjusted for primary tumor site. [b]Estimated difference in FSFI desire subscale attributed to exposure. [c]Wald *P* value used instead of likelihood ratio *P* value. Data were missing from 8 participants.

feminine after their diagnosis and treatment as compared with 15% of colon cancer survivors. Prior studies have established an association between body image distress and low desire, so body image may represent a modifiable risk factor.[7,8] Unfortunately, questions about body image were not included as part of the validated ASCC quality-of-life survey (EORTC QLQ-ANL27), so we were unable to examine this outcome in women with ASCC.

Among participants with all tumor types in this study, FSFI subscales for pain and lubrication were lower than average subscales in control populations (pain, 5.5; lubrication, 5.5),[21] and >50% of ASCC survivors reported significant vaginal dryness or narrowing and a third cited significant dyspareunia. Referral to gynecology to discuss sexual health is recommended before or during pelvic radiation treatment; vaginal dilators are frequently recommended to prevent vaginal stenosis, although evidence of efficacy is limited.[29] Pelvic floor physical therapy may be helpful for chronic pelvic pain and dyspareunia following treatment. Most patients treated for CRC or ASCC will be in menopause related to age or treatment; vaginal lubricants and vaginal estrogen are safe treatments for vulvovaginal discomfort related to menopause, although efficacy data are limited.[30] Treatments directed at vaginal stenosis and genitourinary syndrome of menopause may be helpful in reducing dyspareunia and confer functional recovery among CRC and ASCC survivors.

Desire scores were persistently low across all time points, and most sexually active women met criteria for hypoactive sexual disorder >2 years out from treatment.[22] The IQR of the desire scores in this sample was 1.7-fold the reported minimum clinically important difference of 0.7, indicating significant variability among participants.[31] While we did not identify specific predictors of changes in desire, the persistent and prevalent low desire indicates a need for a holistic model of sexual health care. The biopsychosocial model[32] has been proposed to understand the multifactorial determinants of female sexual dysfunction. Accordingly, interventions directed toward the physiologic and psychosocial factors that underpin low desire are needed as part of sexual health care in cancer survivorship.

Key strengths of our study include the availability of longitudinal data and use of the validated FSFI. Women with ASCC composed 22% of our cohort, allowing for insight into this rare disease group where there is a paucity of sexual health data. Consistent with the original validation of the FSFI, we analyzed FSFI scores from sexually active women. In other studies, when data from all individuals regardless of sexual activity status are reported, desire subscale averages were 1.8 to 2.3,[6,33–36] as opposed to 3 to 3.1 for studies reporting only the FSFI scores of sexually active women.[7,8] This discrepancy highlights the importance of defining sexual activity status when reporting FSFI scores to allow for appropriate comparison. Additionally, study participants were not selected by referral to a sexual health intervention; therefore, this sample may be more representative of an academic cancer center survivorship population as compared with studies focused on individuals who present for sexual health concerns.

Limitations of this study include the variable time from end of treatment to enrollment and small sample size. Another important limitation is that without a pretreatment or prediagnosis assessment of desire or sexual function, it is challenging to evaluate treatment effects on sexual function. When considering the external validity of this study, we note limited racial/ethnic diversity (73% of participants self-identified as White). CRC disproportionally affects individuals who

identify as Black,[37] who were underrepresented in the current study; more research on survivorship issues among this patient population is critically needed. Detailed information about sexual orientation, partnered status beyond marital status, and partner availability was not collected. Additionally, questionnaires were administered only to English-speaking participants. While transgender women or nonbinary individuals would have been eligible to participate, all participants in our cohort identified as cisgender.

Overall, these results highlight the high prevalence of sexual health concerns after the treatment of CRC and ASCC, which persisted for years after treatment was completed. Patients with CRC commonly reported body image dissatisfaction, and those with ASCC cited challenges with vaginal dryness, vaginal narrowing, and dyspareunia. We found persistently low FSFI total scores and desire scores after treatment, suggesting that patients should not expect an eventual rebound of sexual function and may benefit from holistic sexual health care.

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