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Symptom Burden Among Young Adults with Breast or Colorectal Cancer (ECOG E2Z02)

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Abstract

Background—Cancer incidence has increased among young adults (YAs) and survival rates have not improved compared to other age groups. Patient-reported outcomes may enhance our understanding of this vulnerable population.

Methods—In a multisite prospective study, patients completed a cancer symptom inventory at enrollment (T1) and 4–5 weeks later (T2). YAs (< 39 years) with breast or colorectal cancer were compared to older adults (> 40 years) with breast or colorectal cancer on symptom burden, interference, changes over time and medical care.

Results—Participants included 1544 breast cancer patients (YAs=96) and 718 colorectal cancer patients (YAs=37). Compared to older adults, YAs with breast cancer were more likely to report moderate/severe drowsiness, hair loss and symptom interference with relationships at T1. YAs with colorectal cancer were more likely to report moderate/severe pain, fatigue, nausea, distress, drowsiness, shortness of breath and rash plus interference in general activity, mood, work, relationships and life enjoyment than older adults. Compared to older adults, shortness of breath, appetite, and sore mouth were more likely to improve in YAs with breast cancer; vomiting was less likely to improve in YAs with colorectal cancer. Referrals for supportive care were few, especially among colorectal cancer. YAs with breast cancer were somewhat more likely to be referred to nutrition and psychiatry services than older patients.

Conclusions—YAs reported symptom burden, interference and time course distinct from older patients. Distinctions differ by diagnostic group. These findings enhance understanding of symptom burden in YAs and inform development of targeted interventions and future research.

Keywords

prospective study; young adults; breast cancer; colorectal cancer

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Introduction

The field of Adolescent and Young Adult (AYA) Oncology emerged with the realization that, unlike older and younger groups, persons diagnosed with cancer between 15-39 years of age have not benefited from significant improvements in survival rates over more than two decades. AYAs have a high rate of uninsured and underinsured individuals, poor continuity of care, and limited participation in cancer clinical trials, factors that have led to the identification of AYAs with cancer as an underserved or underrepresented group. In 2005–2006 the National Cancer Institute and the LIVESTRONG Foundation conducted a progress review group which published a report highlighting the unique clinical and research needs of AYAs and formulated a strategic plan for improving quality of life (QOL) and outcomes. Their first recommendation was to “identify the characteristics that distinguish the unique cancer burden in the AYA cancer patient.”¹ Symptom burden has not been examined in persons diagnosed with common solid tumors in their 20s and 30s and may be distinct from that of persons diagnosed later in life. This paper examines the symptom burden experienced by young adults receiving treatment for breast or colorectal cancer.

Breast Cancer in Young Adults (YAs)

Breast cancer is the most common cancer in YAs. Breast cancer is the 7th most frequent cancer in women between 20–29 and the most frequent among those ages 30–39.² Younger women with breast cancer are more likely to have larger, higher grade, less hormone-sensitive tumors with more frequent and extensive lymph node involvement.³ Younger age is associated with poorer outcomes, independent of stage at diagnosis or histology, and breast cancer is the leading cause of cancer-related death in women ages 15–29.^{3,4} Further, incidence rates of breast cancer with distant involvement among YA have increased to a small degree over the past 30+ years.⁵ Younger women with breast cancer also experience a greater level of stress, depressive symptoms and lower QOL than their older counterparts.⁶ Other concerns include weight gain/physical inactivity, infertility, and symptoms associated with premature menopause.⁶

Colorectal Cancer in YAs

Less is known about YAs with colorectal cancers. National SEER registry data show that incidence rates in adults between the ages of 20–40 are rising while rates are stable (colon), and declining (rectal) for older patients.⁷ YAs are more likely to have adverse biological features including heritable forms of colorectal cancer, microsatellite instability, and mucinous adenocarcinoma.³ They are more likely to present with less localized and poorly differentiated tumors and later stage disease.^{3,7} One review found that stage adjusted survival is similar for YAs and older adults; however, the youngest YAs tend to fare worse with the lowest survival rates.⁸ Further, an analysis of toxicities among persons with advanced colorectal cancer participating in phase 3 clinical trials found that persons under 40 experience worse nausea and vomiting.⁹ To our knowledge, there is no published data on symptom burden in YAs diagnosed with colorectal cancer.

Study Aims

The primary aim of this study was to examine the symptom burden experienced by YAs receiving treatment for breast or colorectal cancer. We compared YAs to their older peers with breast or colorectal cancer to determine if they experience differences in severity of symptoms, interference with function from symptoms, or changes in symptoms over time. We explored differences in referral patterns for symptom management by age and whether relationships between symptom severity and QOL, performance status and symptom interference are moderated by age.

Methods

Study Design and Procedures

In the Eastern Cooperative Oncology Group (ECOG) E2Z02 Symptom Outcomes and Practice Patterns Study (SOAPP), patients with invasive cancer of the breast, prostate, colon/rectum, or lung were enrolled from multiple academic (n=6) and community sites (n=32). Institutional Review Board approval was obtained from each institution. Participants were greater than 18 years of age, receiving care at an ECOG-affiliated institution, willing to complete a follow-up survey, and had adequate cognitive function for completing surveys. Participants were enrolled at any point during their cancer care and provided informed consent prior to participation. Participants completed a survey at enrollment (T1) and 4–5 weeks later (T2). Additional study design and procedures have been published and the protocol and case report forms are accessible on the study website.^{10,11} The large cohort recruited for this study identified samples of YAs of sufficient size to allow comparisons to older adults with breast or colorectal cancers. This study examined only those participants diagnosed with breast and colorectal cancers as young adults with lung and prostate cancers were rare both in this sample and in the general population.

Measures

The SOAPP survey completed at T1 collected participants' clinical and demographic information, including cancer treatment history and current therapies. Participants were asked to rate their overall QOL on a 5-point Likert scale from 1 ("excellent") to 5 ("very poor") at T1. At T2 participants rated their overall QOL compared to T1; Likert scale ranging from 1 ("much better") to 5 ("much worse"). At T1, clinicians rated participant ECOG performance status,¹² and reported if participants were referred to another service or provider for additional symptom management. Twelve referral options were recorded including: pain, palliative care, combined pain/palliative care, psychiatry, physical therapy/occupational therapy, nutrition, chaplain, wound/enterostomal, speech therapy, complementary therapy, radiation therapy or "other". At both time points, symptom severity and functional interference were assessed using a modification of the validated MD Anderson Symptom Inventory (MDASI). The MDASI is a 19-item inventory that asks participants to rate their symptom severity "at their worst" in the previous 24 hours.¹³ Each item is rated on an 11-point Likert scale ranging from 0 ("not present") to 10 ("as bad as you can imagine"). The MDASI also includes 6 items that assess how much symptoms have interfered with functioning in the past 24 hours. Interference items are rated on an 11-point scale from 0 ("did not interfere") to 10 ("interfered completely").

Statistical Analyses

The association between age groups and patient characteristics was examined using the Chi-square test. The proportion of moderate/severe symptom and symptom interference (defined as item rating of 5) was compared between YAs and older patients for each symptom and interference item using Fisher's exact test. Multivariable logistic regression models examined the association between age and symptom severity or interference at T1. Variables possibly associated with age and/or symptom burden were included as covariates in the models for each MDASI item to estimate the adjusted effect of age including: race, ethnicity, disease status, advanced disease, performance status, weight loss in the previous 6 months, prior systemic or radiotherapy, currently receiving therapy, counseling service, participating in support group, number of current medications, years since cancer diagnosis and gender (for colorectal cancer). The adjusted effect of age on symptom change between T1 and T2 was examined via ordinal logistic models using the same set of covariates listed above plus type of institution (community vs. academic), QOL and MDASI symptom score at T1 as these variables were possibly associated with symptom change. A multivariable logistic model was also fit to examine the association between age groups and symptom management referral (any referral vs. none as the dependent variable). Covariates included those listed for symptom burden, plus type of institution, QOL and symptom interference level (measured by mean score of interference items) at T1 as these variables were possibly associated with generation of referrals.

Multivariable logistic and linear regression analyses were performed to determine if the relationship between symptom severity as measured by the MDASI total score (mean of the 19 symptom ratings) and important health outcomes including overall QOL, ECOG performance status, and symptom interference were modified by age group by including age-by-symptom severity interaction terms.

For all regression analyses, robust standard errors of mean were used to account for the clustering effect of institutions. A category for missing data was generated for categorical covariates if the proportion of missing data was no less than 5 percent. For categorical covariates with less than 5 percent missing data and continuous covariate (i.e., year since cancer diagnosis, 35 patients had missing value), patients with missing data were excluded from the logistic models. No adjustment was made for multiple comparisons. All P values were two-sided and $P < 0.05$ was considered statistically significant. STATA 11.2 software was used for all data analysis.¹⁴

Results

Participants

Participants included 718 persons with colorectal cancer and 1544 with breast cancer. YAs comprised 6.22% of the breast cancer cases (n=96) and 5.15% of the colorectal cases (n=37). At the time of enrollment, the average age of YAs was 35.1 years (SD=4.3) and 60.5 (SD=10.9) for older adults. Details about disease and treatment by age group and diagnosis at the time of enrollment are provided in Table 1.

Breast Cancer

YAs with breast cancer reported a statistically significant higher proportion of moderate/severe drowsiness (31.6% vs. 20.8%) and hair loss (36.8% vs. 21.5%) than their older counterparts at T1, and the association remained significant in multivariable logistic models (drowsiness: adjusted OR=1.95, 95% CI: 1.14–3.35; hair loss: adjusted OR=1.93, 95% CI: 1.33–2.78). There were no differences between age groups for the other 17 symptoms of the MDASI ($p>0.05$ for all; Table 2). YAs also reported a statistically higher proportion of moderate/severe symptom interference in relations with others (22.9% vs. 10.9%, adjusted OR=2.38, 95% CI: 1.17–4.80) than older women with breast cancer (Table 2). Even so, ordinal logistic regression analysis show that YAs with breast cancer were more likely to have improvements in shortness of breath (adjusted OR=1.77, 95% CI: 1.09–2.87), lack of appetite, (adjusted OR=2.22, 95% CI: 1.21–4.06) and sore mouth (adjusted OR=2.52, 95% CI: 1.18–5.39) from T1 to T2 when compared to older patients (Table 3). There were no statistically significant differences in symptom improvement between YAs and older patients for the other 16 symptoms ($p>0.05$ for all). YAs with breast cancer were more likely to be referred for additional symptom management services than older patients (9.53% vs. 19.79%, adjusted OR=2.20, 95% CI: 1.38–3.51, $P=0.001$). A statistically greater percentage of YAs were referred to psychiatry (0.35% vs. 3.13%, $p<0.001$) and nutrition services (0.35% vs. 5.21%, $p<0.001$).

Colorectal Cancer

YAs with colorectal cancer were more likely to report moderate/severe pain (adjusted OR=1.90, 95% CI: 1.09–3.32), fatigue (adjusted OR=2.68, 95% CI: 1.30–5.53), nausea (adjusted OR=2.59, 95% CI: 1.02–6.59), distress (adjusted OR=3.63, 95% CI: 1.58–8.32), shortness of breath (adjusted OR=2.42, 95% CI: 1.05–5.58), drowsiness (adjusted OR=3.05, 95% CI: 1.44–6.42) and rash (adjusted OR=2.80, 95% CI: 1.00–7.84) than their older counterparts at T1 (Table 4). YAs also reported greater symptom interference with general activity (adjusted OR=3.01, 95% CI: 1.56–5.79), mood (adjusted OR=3.80, 95% CI: 2.02–7.12), work (adjusted OR=2.57, 95% CI: 1.39–4.74), relations with others (adjusted OR=3.04, 95% CI: 1.14–8.11), and enjoyment in life (adjusted OR=3.03, 95% CI: 1.37–6.69) than older persons with colorectal cancer (Table 4). Ordinal logistic regression showed that YAs with colorectal cancer were less likely to have improved in vomiting from T1 to T2 compared to older patients (adjusted OR=0.30, 95% CI: 0.10–0.88); differences on the other MDASI items were not significant ($P>0.05$ for all; Table 3). Multivariable logistic regression examining referrals for symptom management showed no difference when comparing YAs with colorectal cancer to older patients (8.1% vs. 7.2%, adjusted OR=0.79, 95% CI: 0.42–1.50, $P=0.468$). However, referrals for symptom management were few for persons with colorectal cancer regardless of age. Only 3 of the YAs with colorectal cancer were referred for radiation therapy or “other therapy,” and none were referred to the other 10 referral options.

Effect Modification Models

Regressions were performed to determine if the relationships between overall symptom severity (MDASI total score) and QOL, ECOG performance status, and symptom

interference were modified by age group. While there was a trend for symptom burden to have a smaller effect on performance status and QOL in YAs compared to older patients, only one of these relationships reached statistical significance. Specifically, there was a significant positive association between symptom severity and performance status in older patients with breast cancer (adjusted OR=0.75, 95% CI: 0.57–0.99), while the association was not significant in YAs with breast cancer ($P=0.042$ for interaction). For associations between symptom severity and interference, the interaction terms for these regressions were also not significant ($P>0.05$ for interaction in all models). Greater symptom severity was significantly associated with greater symptom interference for both age groups ($P<0.001$ for symptom severity in all models).

Discussion

This large prospective study of symptoms in outpatient breast and colorectal patients receiving treatment in community-based settings provided a rare opportunity to compare symptom burden among YAs and older patients. Such comparisons are often impractical because of the relatively low prevalence rate of cancer in YAs. Approximately 6–7% of colorectal and breast cancer cases are diagnosed before the age of 40 and more cases are diagnosed in individuals in their 30s vs. their 20s. The percentage of YAs in this study (5–6%) and the mean age of 35 is comparable to national statistics.^{8,15}

We compared the symptom burden experienced by YAs receiving treatment for breast or colorectal cancers to their older counterparts while accounting for the influence of disease stage and current/prior treatment. YAs with breast cancer reported a greater proportion of moderate/severe drowsiness and hair loss than their older peers; however the other 17 symptoms were comparable between age groups. YAs with breast cancer also reported a higher proportion of moderate/severe symptom interference in relations with others. Even so, YAs with breast cancer were more likely to have improvements in some symptoms including shortness of breath, lack of appetite and mouth soreness over time. For colorectal cancer, the differences in symptom burden between age groups were more striking with YAs faring worse. A greater proportion of YAs with colorectal cancer reported moderate/severe pain, fatigue, nausea, distress, shortness of breath, drowsiness, and rash as well as greater symptom interference in general activity, mood, work, relations with others, and enjoyment in life compared to their older counterparts. YAs with colorectal cancer were less likely to show improvements in vomiting over time compared to older patients, confirming results of Blanke et al.⁹ and suggesting that further investigation into antiemetic therapy for this group is warranted. Overall, these findings have important implications for symptom assessment in YAs as they appear to have a different symptom profile and experience more significant interference in functioning.

Referral patterns for symptom management also differed by age group and by disease. Overall, referral rates were relatively low given the reported symptom burden at T1. Still, YAs with breast cancer were more likely to be referred for additional symptom management services than older breast cancer patients, significantly so for psychiatry and nutrition services. Within colorectal patients there was no difference between age groups in referral patterns. However, referral rates were negligible for colorectal patients regardless of age.

Only 3 of the YAs with colorectal cancer were referred for any services; specifically they were referred for radiation therapy or the more nondescript category of “other therapy.” None were referred to the other 10 types of services despite their marked symptom burden. Interestingly, recent research examining quality of care for comorbid conditions in Medicare patients (≥ 66 years of age) found that breast cancer survivors received better or equivalent care compared to controls for comorbid conditions while colorectal survivors received worse care than controls for chronic and acute conditions.¹⁶ Similarly, our results suggest dissimilar referral patterns for symptom management between breast and colorectal patients and between younger vs. older patients, warranting additional investigation to inform interventions for improving overall care for all survivors.

Finally, we explored the relations between symptom burden and patient-reported QOL, ECOG performance status and symptom interference to determine if observed relations were moderated by age. We hypothesized that YAs might have more difficulty managing their symptoms and thus report poorer QOL, poorer ECOG performance status, and greater symptom interference relative to older patients with comparable levels of symptoms. This hypothesis was not supported; in fact, for breast cancer patients, symptom burden had significant impact on performance status in older adults but not in YAs. This may suggest greater resiliency in YAs despite greater symptom burden. Of note, our QOL measure was a one item measure and results may differ if utilizing a more sensitive multi-item, health-related QOL inventory.

This study supports the feasibility and value of utilizing the NCI-funded National Clinical Trials Network to gather data on a relatively small and underserved group. The generalizability of this study is limited to patients receiving care at sites affiliated with a US clinical cooperative oncology group. Also, the SOAPP survey did not collect data on comorbidities, socioeconomic status, or insurance status, all of which may be associated with the differences observed between older and younger patients. Young adults may have more aggressive disease and/or receive more aggressive treatment for disease.^{3,4,7} In our sample, all participants tended to demonstrate similar symptom patterns; persons with more advanced disease reporting greater symptom burden. Although we did statistically control for prior or current therapies and disease stage we did not have data on specific agents or doses of therapy for each patient and our sample sizes did not allow for stratification by disease stage or treatment. Finally, given the observational and post-hoc exploratory nature of the study, the smaller sample size of YA subgroups, and the large number of statistical tests, P-values must be considered with caution. To our knowledge this is the first assessment of symptom burden among a national sample of YAs recruited from multiple academic and community settings. Therefore, despite the above limitations our results provide a unique contribution to improving our understanding of this underserved population.

In conclusion, YAs with breast and colorectal cancer experience distinct symptom burden in comparison to their older counterparts including differences in severity, interference and changes in some symptoms over time. These differences are divergent by primary site with the most marked differences being between older and younger persons with colorectal cancer. These results enhance understanding of the symptom management and supportive

care needs for YAs with breast and colorectal cancer. The data here suggest a need for future studies to help explain the differences observed in symptom burden between older and younger patients as well as the very low referral patterns observed in colorectal cancer in particular. Mixed method designs (e.g. quantitative and qualitative) may be useful as the factors contributing to the observed difference may be numerous (e.g. differing health care access, differing treatment approaches, or some underlying biological difference between groups). Questions about whether observed differences warranted distinct treatment or resources remain unanswered. Ultimately, patient-centered care will entail interventions to improve access to and receipt of adequate symptom management for cancer patients of all ages and diagnoses with equal access for groups at risk for disparities in care.

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Table 1

Patient demographics and disease characteristics at T1

Variable	Breast Cancer (n=1544)				Colorectal Cancer (n=718)			
	N	Col%	N	Col%	N	Col%	N	Col%
Gender								
Female	1445	99.79	96	100	328	48.16	18	48.65
Male	3	0.21	0	0	353	51.84	19	51.35
Ethnicity								
Hispanic	108	8.07	14	15.22*	82	12.75	11	30.56**
Non-Hispanic	1226	91.63	78	84.78	558	86.78	25	69.44
Other	4	0.30	0	0	3	0.47	0	0
Race								
White	1251	87.30	79	83.16	568	84.27	31	83.78
Black	159	11.10	12	12.63	92	13.65	6	16.22
Other	23	1.61	4	4.21	14	2.08	0	0
Current status of disease								
Complete Disappearance of Lesions	763	53.06	43	45.26	233	34.42	10	27.03
Partial Response	39	2.71	6	6.32	24	3.55	4	10.81
Stable	489	34.01	36	37.89	304	44.90	20	54.05
Progression	147	10.22	10	10.53	116	17.13	3	8.11
Current stage of disease								
No evidence of disease	857	59.47	44	45.83**	271	39.91	11	29.73
Local/regional	213	14.78	28	29.17	86	12.67	9	24.32
Metastatic	329	22.83	19	19.79	276	40.65	13	35.14
Local/regional & Metastatic	42	2.92	5	5.21	46	6.78	4	10.81
Prior Chemo/Endocrine Therapy								
No	482	33.29	38	39.58	275	40.38	19	51.35
Yes	966	66.71	58	60.42	406	59.62	18	48.65
Prior radiation therapy								
No	742	51.74	59	61.46	519	76.78	31	83.78

Variable	Breast Cancer (n=1544)				Colorectal Cancer (n=718)			
	40 years old (n=1448)		39 years old (n=96)		40 years old (n=681)		39 years old (n=37)	
	N	Col%	N	Col%	N	Col%	N	Col%
Yes	692	48.26	37	38.54	157	23.22	6	16.22
Currently receiving therapy								
No	323	22.31	18	18.75	198	29.07	5	13.51*
Yes	1125	77.69	78	81.25	483	70.93	32	86.49
Current radiation therapy								
No	1359	94.97	89	96.74	651	96.16	35	97.22
Yes	72	5.03	3	3.26	26	3.84	1	2.78
# of medications currently taking								
0-4	440	33.66	47	56.63**	226	36.81	16	59.26*
5-9	596	45.60	30	36.14	258	42.02	10	37.04
10	271	20.73	6	7.23	130	21.17	1	3.70
Age at study entry (mean/sd)	59.25	10.53	35.34	4.22	63.07	11.27	34.37	4.42

* = p<0.05 from Fisher exact test indicating significant difference between age groups

** = P<.01

Table 2

Moderate/severe symptoms at T1 in breast cancer patients

Symptoms	% of moderate/severe symptoms				Multivariable logistic model			
	40 years old		39 years old		Adjusted OR	LCI	UCI	
	N	%	N	%				
pain	263	18.35	19	20.00	1.05	0.55	2.00	
fatigue	435	30.74	38	40.43	1.62	0.96	2.74	
nausea	97	6.78	10	10.53	1.52	0.64	3.61	
disturbed sleep	385	26.87	35	36.46*	1.54	0.87	2.73	
distress	264	18.42	25	26.32	1.38	0.76	2.52	
Shortness of breath	154	10.73	5	5.21	0.50	0.21	1.20	
remembering	244	16.99	19	20	1.29	0.67	2.48	
Lack of appetite	166	11.60	15	16.13	1.49	0.81	2.77	
drowsiness	299	20.84	30	31.58*	1.95*	1.14	3.35	
Dry mouth	268	18.78	23	23.96	1.46	0.85	2.51	
sad	227	15.80	20	20.83	1.26	0.74	2.15	
vomiting	49	3.42	5	5.21	1.50	0.48	4.65	
numbness	246	17.13	13	13.54	0.77	0.40	1.46	
diarrhea	127	8.82	9	9.38	1.11	0.63	1.96	
constipation	159	11.16	15	15.63	1.73	0.76	3.94	
Sore mouth	58	4.03	4	4.17	0.81	0.22	3.01	
rash	83	5.79	5	5.21	0.72	0.20	2.55	
Hair loss	309	21.53	35	36.84**	1.93**	1.33	2.78	
coughing	112	7.78	10	10.42	1.49	0.70	3.18	
Symptom Interference								
General activity	295	20.54	26	27.37	1.23	0.60	2.49	
Mood	249	17.38	24	25	1.24	0.65	2.37	
Work	311	21.63	26	27.08	1.30	0.67	2.49	
Relations	156	10.86	22	22.92**	2.38*	1.17	4.80	

	% of moderate/severe symptoms		Multivariable logistic model		
	40 years old	39 years old	Adjusted OR	LCI	UCI
	N	N			
	%	%			
Walking	282	16	0.84	0.43	1.64
Enjoyment of life	237	22	1.39	0.71	2.71

* = p<.05;

** =p<.01;

OR= odds ratio; N = number of patients with moderate/severe symptoms; LCI= Lower 95% Confidence Interval; UCI= Upper 95% Confidence Interval. Each symptom is coded as moderate /severe =1, no/mild =0; OR is for comparison between younger and older patients, after adjusting for other covariates. OR >1 indicates younger patients have higher odds of having moderate/severe symptom than older patients. Covariates include: race, ethnicity, disease status, advanced disease, performance status, weight loss in the previous 6 months, prior systemic or radiotherapy, currently receiving therapy, counseling service, participating in support group, number of current medications, and years since cancer diagnosis.

Table 3

Ordinal logistic regression for symptom change between T1 and T2

Symptom	Breast				Colorectal			
	Adjusted OR	LCI	UCI	UCI	Adjusted OR	LCI	UCI	UCI
pain	0.76	0.41	1.39	0.53	0.19	1.46		
fatigue	0.78	0.45	1.37	0.67	0.37	1.22		
nausea	0.90	0.46	1.76	0.41	0.16	1.05		
disturbed sleep	0.69	0.45	1.04	1.00	0.38	2.66		
distress	0.75	0.46	1.20	0.71	0.29	1.71		
Shortness of breath	1.77*	1.09	2.87	1.25	0.45	3.52		
remembering	0.98	0.62	1.56	0.88	0.36	2.18		
Lack of appetite	2.22**	1.21	4.06	1.08	0.44	2.67		
drowsiness	1.04	0.60	1.80	0.72	0.33	1.57		
Dry mouth	1.61	0.96	2.70	0.96	0.49	1.90		
sad	0.91	0.52	1.57	0.95	0.31	2.91		
vomiting	1.18	0.36	3.85	0.30*	0.10	0.88		
numbness	1.09	0.65	1.81	0.58	0.24	1.39		
diarrhea	1.30	0.77	2.18	0.80	0.36	1.79		
constipation	1.22	0.71	2.09	0.96	0.37	2.52		
Sore mouth	2.52*	1.18	5.39	2.06	0.92	4.60		
rash	1.59	0.73	3.45	1.41	0.64	3.11		
Hair loss	0.94	0.54	1.64	1.67	0.67	4.17		
coughing	1.13	0.61	2.08	0.87	0.39	1.93		

Note:

* = p<.05;

** =p<.01;

OR= odds ratio; LCI= Lower 95% Confidence Interval; UCI= Upper 95% Confidence Interval. Each symptom is coded as worse=0, stable=1, better=2. The regression is modeling symptom improvement; OR is for comparison between younger and older patients, after adjusting for other covariates. OR >1 indicates younger patients have higher odds of having improved symptoms than older patients. OR<1 indicates younger patients are less likely to have improved symptom compared to older patients. Covariates include: race, ethnicity, disease status, advanced disease, performance status, weight loss in the previous 6 months, prior systemic or radiotherapy, currently receiving therapy, counseling service, participating in support group, number of current medications, years since cancer diagnosis, gender (for colorectal), type of institution, QOL and MDASI symptom score at T1.

Table 4

Moderate/severe symptoms at T1 in colorectal cancer patients

Symptom	% of moderate/severe symptoms		Multivariable logistic model		
	40 years old	39 years old	Adjusted OR	LCI	UCI
	N	%	N	%	
pain	121	18.06	10	27.03	1.90* 1.09 3.32
fatigue	212	31.98	18	48.65*	2.68** 1.30 5.53
nausea	63	9.39	8	21.62*	2.59* 1.02 6.59
disturbed sleep	151	22.64	11	29.73	1.68 0.77 3.67
distress	113	16.82	14	37.84**	3.63** 1.58 8.32
Shortness of breath	74	11.01	7	18.92	2.42* 1.05 5.58
remembering	94	13.97	10	27.03*	2.47 0.94 6.46
Lack of appetite	113	16.87	9	24.32	1.50 0.51 4.39
drowsiness	146	21.66	16	43.24**	3.05** 1.44 6.42
Dry mouth	105	15.65	6	16.22	1.26 0.48 3.34
sad	91	13.56	9	24.32	2.17 0.83 5.67
vomiting	22	3.27	3	8.11	2.00 0.38 10.64
numbness	171	25.45	12	32.43	1.37 0.60 3.15
diarrhea	106	15.77	6	16.22	1.49 0.56 3.94
constipation	73	10.88	5	13.51	1.32 0.51 3.38
Sore mouth	41	6.10	2	5.41	0.82 0.23 2.96
rash	63	9.43	6	16.22	2.80* 1.00 7.84
Hair loss	71	10.61	4	10.81	0.65 0.15 2.78
coughing	41	6.10	4	10.81	2.53 0.71 8.99
Symptom Interference					
General activity	146	21.73	16	43.24**	3.01** 1.56 5.79
Mood	103	15.30	15	40.54**	3.80** 2.02 7.12

	% of moderate/severe symptoms		Multivariable logistic model			
	40 years old	39 years old	Adjusted OR	LCI	UCI	UCI
	N	%	N	%		
Work	150	22.35	15	40.54*	2.57**	1.39 4.74
Relations	74	11.03	9	24.32*	3.04*	1.14 8.11
Walking	150	22.32	10	27.03	1.52	0.74 3.14
Enjoyment of life	131	19.47	14	37.84**	3.03**	1.37 6.69

* = p<.05;

** =p<.01;

OR= odds ratio; N= number of patients with moderate/severe symptoms; LCI= Lower 95% Confidence Interval; UCI= Upper 95% Confidence Interval. Each symptom is coded as moderate /severe =1, no/mild =0; OR is for comparison between younger and older patients, after adjusting for other covariates. OR >1 indicates younger patients have higher odds of having moderate/severe symptom than older patients. Covariates include: race, ethnicity, disease status, advanced disease, performance status, weight loss in the previous 6 months, prior systemic or radiotherapy, currently receiving therapy, counseling service, participating in support group, number of current medications, years since cancer diagnosis and gender.