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Predictors of depressive symptomatology of geriatric patients with colorectal cancer

A longitudinal view

Published online: 31 January 2002
© Springer-Verlag 2002

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Abstract Colorectal cancer constitutes a major health problem for elderly patients. The disease and its stage, treatment, and attendant symptoms can have significant negative impact on the mental functioning of these patients. As part of a larger longitudinal study, 158 patients 65 years of age or older with an incident diagnosis of colorectal cancer were recruited from 23 sites within a Midwestern state. Random effects regression analysis techniques were used to analyze how age, gender, race, presence of a family caregiver, co-morbid conditions, stage of disease at diagnosis, and the time-dependent variables marital status, employment status, symptoms, physical functioning, social functioning, and treatment predict depressive symptomatology at four assessments over the 1st year following diagnosis. Gender, race, co-morbid conditions, physical functioning, social functioning, and symptoms

were significant predictors of depressive symptomatology over the four waves of the study. Female patients, African Americans, and patients with two or more co-morbid conditions exhibited more depressive symptomatology. Both more symptoms and more restricted physical and social functioning corresponded to higher levels of depressive symptomatology. At a clinical level of patient care, these findings mandate early identification of psychosocial difficulties experienced, an individualized symptom management plan and the application of other interventions, such as information giving, reassurance and referral to other resources, with particular attention to African American and female patients.

Keywords Depression · Colorectal cancer · Symptoms · Physical functioning · Social functioning

Introduction

Colorectal cancer (CRC) is the second most commonly diagnosed cancer in the developed world [23] and constitutes a major health problem in elderly patients. Incidence rates rise with age, and over 40% of cases occur in subjects over the age of 74 [2]. Survival rates for CRC are lower than for many other cancers, and vary dramatically by stage: from 7% 5-year survival when there is distant spread of the disease to 91% 5-year survival when the disease is localized [1].

As many as half of all cancer patients experience depressive symptoms [10]. Cancer and its stage, treatment, and attendant symptoms can also have significant negative impact on the physical and social functioning of these patients [16]. For the elderly, a further source of problems may be the presence of other co-morbid conditions. Thus, it is not surprising that elderly CRC patients often exhibit significant emotional distress, most commonly manifested by depression and anxiety, which begin with the diagnosis and may continue throughout treatment [14, 27].

The most common psychiatric diagnosis in older patients is reactive or secondary anxiety and depression related to illness [13]. Depressive symptoms can adversely affect a cancer patient by interfering with cancer treatment, increasing the length of hospital stay, reducing ability to care for oneself, impairing quality of life and possibly reducing overall survival time [19, 33]. Kurtz et al. [17], in their study of elderly women with colorectal, breast or lung cancer, observed that the mental health of the CRC patients was strongly related to the patients' symptom experience. Symptoms may contribute to depressive symptomatology and thus present additional clinical problems.

Schag et al. [29], in their study of the quality of life of patients with lung, colorectal and prostate cancers, reported that both psychosocial functioning and overall quality of life improved for survivors of CRC as they lived for longer periods. In an outline of a research agenda for better care for older persons with cancer, Kane [15] argues that longitudinal studies are needed which examine how psychological states and social circumstances, as well as health care interventions affect psychological outcomes over time. Against this backdrop, the current longitudinal study of CRC patients 65 years and older was designed to seek answers to the following questions:

1. How do such patient characteristics as age, gender, race, the availability of a designated family caregiver, co-morbid conditions, and stage of disease at diagnosis affect variations in depressive symptoms at four assessment points over a 1-year period after initial cancer diagnosis?
2. How do the aforementioned patient characteristics and the variables that change over time, such as marital status, employment status, symptom experience, physical functioning, social functioning, and treatment predict changes in depressive symptoms at the four assessments following a diagnosis of CRC?

Materials and methods

As part of a larger longitudinal study of 1,200 cancer patients each newly diagnosed with one of the four major diagnoses (breast, colorectal, lung, prostate), 234 patients aged 65 or older with an incident diagnosis of CRC were recruited from 23 sites within a Midwestern state between 1993 and 1997. Sites included surgical units of hospitals and outpatient radiation and medical oncology units. Patients were approached in these settings by trained nurse recruiters who explained the research to them and provided them with a brochure summarizing the goals and features of the study, which included: completing four planned interviews over the course, filling out four self-administered questionnaire booklets, and having their medical records audited. Patients who consented to participate were re-contacted later. In order to insure that patients were at comparable points in the course of their treatments, patients were interviewed initially (wave 1) at between 4 and 6 weeks following their surgery or within 2–4 weeks following

their initial radiation or chemotherapy treatment. Of the 234 CRC patients who initially consented, 158 (67.5%) actually completed the wave 1 telephone interview. This compared to 81% among those with cancer of the breast, 69.5% among those with cancer of the lung and 83% of the prostate cancer patients. Follow-up interviews were conducted at 12–16 weeks (wave 2), 26–30 weeks (wave 3), and after 1 year (wave 4). Data on stage of disease and treatment dates were obtained from patient record audits. Informed consent procedures for the longitudinal study were approved both by the appropriate university committee on research involving human subjects and by the institutional review boards of the participating recruitment sites.

Owing to the nature of the study population, there was considerable attrition over the course of the study. Of the 158 CRC patients who participated in the wave 1 interview, 154 responded to the CES-D instrument, with 142 at wave 2, 132 at wave 3, and 118 at wave 4. Nineteen of the patients lost to follow-up died before the end of the 1-year observation period, as confirmed by information from telephone contacts with the families and the Michigan Bureau of Vital Statistics. The remaining patients often refused further participation because they felt too sick to continue [22].

Measures

Depressive symptomatology was measured by the Center for Epidemiological Studies Depression Scale (CES-D) [25, 26]. This is a well-established instrument used for screening persons for symptomatology related to depression. The scale consists of 20 items (Cronbach's alpha = 0.850), each scored on a scale of 0–3 (0 = rarely/none of the time to 3 = almost all of the time). The usual composite score was computed by summing the scores for the 20 items on the scale, with higher scores corresponding to greater depressive symptomatology. A CES-D score of 16 is the most commonly used cutoff score in screening for depressed mood in general populations [26]. In a few cases, missing CES-D scores were imputed [5] using the mental health and role emotional subscales of the SF-36 (which contains items very similar to those of the CES-D mood subscale) from the *same-wave* interview and socio-demographic predictors. (The explained-variance proportions for the linear regression substitution models ranged from 50% to 65%. No more than 11% of the CES-D scores were substituted. In addition, all models were run both with and without the imputed values, yielding very similar parameter estimates.)

Physical functioning and social functioning were measured using subscales of the Medical Outcomes Study (MOS) 36-Item Short Form Health Survey (SF-36) [35]. The SF-36 was designed for use in clinical practice and research, health policy evaluations, and general population surveys [21]. The *physical functioning* subscale of the SF-36 consists of 10 items (Cronbach's alpha = 0.889), including measures of the degree of limitation in activities such as lifting or carrying groceries, bending, kneeling or stooping, walking one block, bathing, and dressing. The individual items capture both the presence and the extent of physical limitations using a three-level response format to the question: "Does your health now limit you in these activities? If yes, how much?" (1 = 'yes, limited a lot', 2 = 'yes, limited a little', 3 = 'no, not limited at all'). Validity studies have shown that this subscale of the SF-36 best distinguishes groups differing in severity of chronic medical condition, and has the purest physical health interpretation [20].

The social functioning subscale of the SF-36 consists of 2 items (Cronbach's alpha = 0.815), which capture (using a five level response format) how frequently and to what degree the patient's normal social contacts with family, friends, etc. are interfered with by their physical health or emotional problems. The scores for both subscales were standardized in the usual way on a scale of 0–100, with higher scores indicating fewer limitations in physical functioning or social activity, respectively [36].

Symptom experience was measured using a shortened version of the *Symptom Experience Scale* [8]. The original scale elicits information on 33 symptoms (nausea, pain, poor appetite, sleeping difficulty, fatigue, constipation, diarrhea, vomiting, etc.) commonly associated with cancer and/or its treatment. However, for current purposes, only 25 of these symptoms were included, excluding all that might also function as indicators of depression. In particular, symptoms referring to mood changes, loss of appetite, sleep problems, or somatic symptoms such as fatigue and weakness were excluded. The patients were presented with a symptom, for example dry mouth, and were then asked whether they had experienced this symptom in the past 2 weeks. The modified symptom scale score was computed as a count of the number of symptoms identified as present just 2 weeks prior to the interview (range 0–25).

To assess *co-morbidity*, the patients were asked to identify from a list of 11 frequently occurring physical and chronic co-morbid conditions (arthritis, hypertension, cardiovascular, emphysema, diabetes, etc.) those that they were currently experiencing. This information was quantified as a grouped variable (0 = no co-morbid conditions, 1 = one co-morbid condition, 2 = two or more co-morbid conditions).

For this study we employed the Tumor, Node, Metastasis (TNM) staging system promulgated by the American Joint Committee on Cancer (AJCC) in the United States. Determination of the stage involves consideration of a number of variables that are important for prognosis (e.g., extent of the tumor, histological type, differentiation, metastasis) and classifies tumors on a scale of 0–IV (0 = localized to IV = distant metastasis) [4, 11, 12].

There are a number of treatment strategies available to CRC patients, including surgery, radiation, and chemotherapy, and also combinations of these. Precise data on treatment types and dates were obtained from audits of patient records. In order to capture the time-dependent nature of these treatment effects, the three types of treatment were coded at each wave as categorical variables in the following way. A code of 0 was assigned if no treatment occurred or it occurred 40 or more days prior to the interview; a code of 1 was assigned if treatment occurred within 39 days of the interview.

Analyses

As an initial step, basic descriptive statistics were computed for the socio-demographic variables and for the means, standard deviations and ranges for all scale variables employed in the study.

Given the panel nature of the data, the analysis of factors affecting depressive symptomatology needs to be able to accommodate three data characteristics. (1) It must take into account all available information, which under conditions of panel attrition means a declining number of cases with available information from interview wave 1 ($N=154$) to wave 4 ($N=118$). (2) The analysis must be able to capture both within-subject effects, i.e., changes in predictors and outcomes from wave to wave, and between-subject effects (e.g., variations across individual study participants). Finally, among the predictors are both time-independent co-variables (e.g., socio-demographic characteristics and diagnostic information) and time-dependent co-variables (e.g., physical functioning, which changes over the observation period). Statistical models that can accommodate these demands are variously known as ‘generalized estimating equations,’ pooled time series regression, or random-effects regression [9, 18]. The main feature of this analysis strategy is the ‘pooling’ of the longitudinal data into a cross-sectional format, which in the current study provides for a total sample size of 546 observations (154 from wave 1, 142 from wave 2, 132 from wave 3 and 118 from wave 4). Since the observations represent both different cases and different interview waves of the same cases, a case identity marker is added to the file to keep track of the repeated observations. During estimation of

the regression model, error terms associated with different wave observations of the same subject are allowed to be correlated with each other. Thus, between-subject variation can be neatly separated from within-subject variation. All analyses were carried out using the ‘xtgee’ and ‘xtreg’ procedures of the STATA software [31].

Results

Table 1 shows the distribution of socio-demographic characteristics among study subjects and also some diagnostic information for each of the four interview waves. Overall, of the 154 colorectal patients with CES-D scores at wave 1, 118 remained in the study at wave 4. It appears that none of the socio-demographic variables shown in Table 1 is strongly related to the 1-year attrition.

Descriptive statistics for the four scale scores employed in the analysis are shown in Table 2. The four-wave pattern appears to show a consistent improvement among the colorectal cancer patients. Symptom and depressive symptomatology scores decline, while the SF-36 subscale scores for physical and social functioning increase (indicating higher levels of functioning at later waves). However, these changes reflect, to a large extent, though not exclusively, the effects of attrition. At any given wave, drop-outs generally score worse than patients who remain in the study for another interview wave. However, moderate declines in depressive symptomatology and symptom scores and increases in physical and social functioning, especially between waves 1 and 2, are observable among the survivors.

Tables 3, 4 and 5 show the results of the pooled time series (random effects) regression analysis. In Table 3, we present a simple model with only the wave indicators as independent variables. The statistically significant regression coefficients confirm the overall pattern of a steady decline in CES-D scores over the observation period. In particular, compared with wave 1 (for most patients, within 6–8 weeks after initial diagnosis), mean CES-D scores are lower by -1.43 in wave 3 and by -1.82 in wave 4. However, most of the variation in CES-D scores remains unexplained as the small R-squared values indicate.

Table 4 includes all time-invariant predictors, i.e., gender, age, race, case type, stage at diagnosis and co-morbid conditions at diagnosis, as well as the wave indicator. It is apparent that the addition of these variables does not change the prediction of the CES-D scores *over time*. In fact, the regression coefficients associated with the changes between interview waves are almost identical to those in the first models presented in Table 3. However, the prediction of *between-subject variation* in CES-D scores is greatly improved (see R^2 -between of 0.258 as opposed to 0.069 in the earlier model). In particular, CRC patients who are *female*, *African American* and report *two or more co-morbid conditions* have con-

Table 1 Patients' socio-demographic information, stage at diagnosis, and number of co-morbid conditions in each of the four interview waves

	Wave 1 (N=154)		Wave 2 (N=142)		Wave 3 (N=132)		Wave 4 (N=118)	
	n	Percent	n	Percent	n	Percent	n	Percent
Gender								
Male	75	48.7	67	47.2	64	48.5	52	44.1
Female	79	51.3	75	52.8	68	51.5	66	55.9
Race								
White/European American	149	96.8	138	97.2	129	97.7	116	98.3
Black/African American	5	3.2	4	2.8	3	2.3	2	1.7
Stage at diagnosis								
0	2	1.4	2	1.5	2	1.6	2	1.8
I	29	20.0	27	19.0	25	19.8	23	20.2
II	54	36.6	51	35.9	48	38.1	47	41.2
III	46	31.7	43	30.3	40	31.7	34	29.8
IV	15	9.7	11	7.7	11	8.7	8	7.0
Missing	8		8		6		4	
No. of co-morbidities								
None	22	14.3	20	14.2	19	14.5	19	16.1
1	36	23.4	33	23.4	32	24.4	27	22.9
2 or more	96	62.4	88	62.4	80	61.1	72	61.0
Missing			1		1			
Patient age								
Mean	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Mean	73	64–93	73	64–93	73	48.5	73	64–93
Household income								
Median (in 1,000)	22.5	8–100	22.8	8–100	27.0	8–100	27.0	8–100
Missing	12		12		11		8	

Table 2 Means and standard deviations for physical functioning, social functioning and symptom count in waves 1 through 4

	Wave 1 (N=154)		Wave 2 (N=142)		Wave 3 (N=132)		Wave 4 (N=118)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
SF-36 Physical functioning	61.0	27.4	74.8	24.8	74.5	28.1	75.1	27.1
Missing	7		2					
SF-36 Social functioning	61.7	30.6	82.5	25.5	80.3	28.4	86.9	25.1
Missing	8		2					
Symptom count	4.5	3.2	4.1	3.3	3.3	2.9	3.1	3.3
Missing			5		5		2	
CES-D Depression score	10.2	7.2	8.9	6.9	8.3	6.3	7.6	6.2

Table 3 Random-effects GLS linear regression model: dependent variable: depressive symptomatology scores (CESD scores) measured in 4 interview waves. No. of person-interview observations: 546; minimum observation per case: 1, maximum observation: 4, average observations per case (3.5); model Chi-square (degrees of freedom: 3): 11.79, $P < 0.008$. R^2 within: 0.023; R^2 between: .069; R^2 overall: 0.016

	Reg. coefficient	Significance level	95% confidence	Interval
Wave observations (wave 1 is reference category)				
Wave 2 interview versus wave 1	-1.01	0.061	-2.06	0.05
Wave 3 interview versus wave 1	-1.43	0.009	-2.51	-0.35
Wave 4 interview versus wave 1	-1.82	0.001	-2.94	-0.70

Table 4 Random-effects GLS linear regression model: dependent variable: depressive symptomatology scores (CESD scores) measured in 4 interview waves. Predictors: time-independent socio-demographic and diagnostic variables. No. of person-interview

observations: 544; minimum observation per case: 1, maximum observation: 4, average observations per case (3.5); model Chi-square (degrees of freedom: 10): 52.83, $P < 0.001$. R^2 -within: 0.023; R^2 -between: 0.258; R^2 -overall: 0.131

	Reg. coefficient	Significance level	95% confidence	Interval
Time/wave-independent predictors:				
Gender (1 = female, 0 = male)	2.98	0.002	1.12	4.85
Age (in years)	-0.02	0.822	-0.18	0.14
Race (1 = African American, 0 = white)	11.31	0.000	6.48	16.15
Case type (1 = caregiver identified, 0 = not identified)	0.24	0.802	-1.61	2.08
Stage at diagnosis (1 = 'late', 0 = 'early')	0.89	0.329	-0.90	2.08
Co-morbid conditions at wave 1 interview				
1 vs 0	2.58	0.080	-0.31	5.46
2+ versus 0	3.02	0.020	0.49	5.57
Wave observations (wave 1 is reference category)				
Wave 2 interview vs wave 1	-1.06	0.049	-2.11	-0.01
Wave 3 interview vs wave 1	-1.41	0.011	-2.49	-0.33
Wave 4 interview vs wave 1	-1.81	0.002	-2.93	-0.69

Table 5 Random-effects GLS linear regression model: dependent variable: depressive symptomatology scores (CESD scores) measured in 4 interview waves. No. of person-interview observations: 511; minimum observation per case: 1, maximum observation: 4,

average observations per case (3.3); model Chi-square (degrees of freedom: 15): 231.25, $P < 0.001$. R^2 -within: 0.255; R^2 -between: 0.533; R^2 -overall: 0.419

	Reg. coefficient	Significance level	95% confidence	Interval
Time/wave-independent predictors				
Gender (1 = female, 0 = male)	2.01	0.024	0.27	3.76
Age (in years)	-0.09	0.182	-0.22	0.04
Race (1 = African American, 0 = white)	7.97	0.000	3.73	12.22
Case type (1 = caregiver identified, 0 = not identified)	0.80	0.318	-0.77	2.37
Stage at diagnosis (1 = 'late', 0 = 'early')	-0.51	0.499	-2.02	0.99
Co-morbid conditions at wave 1 interview				
1 vs 0	2.19	0.074	-0.21	4.58
2+ vs 0	2.46	0.024	-0.32	4.60
Time/wave-dependent predictors				
Marital status (1 = married, 0 = not married)	0.39	0.661	-1.34	2.11
Employment status (1 = employed at interview, 0 = not employed)	-0.76	0.181	-1.88	0.35
Symptoms count	0.35	0.000	0.17	0.53
SF36-Physical Functioning Score	-0.05	0.000	-0.07	-0.02
SF36-Social Functioning Score	-0.06	0.000	-0.08	-0.04
Wave observations (wave 1 is reference category)				
Wave 2 interview versus wave 1	2.93	0.371	-3.49	9.36
Wave 3 interview versus wave 1	-3.54	0.114	-7.94	0.85
Wave 4 interview versus wave 1	6.07	0.080	-0.72	12.87
Surgery 30 days prior to interview (1 = yes, 0 = no)	0.06	0.943	-1.65	1.78
Chemotherapy 30 days prior to interview (1 = yes, 0 = no)	-0.42	0.628	-2.14	1.29
Radiation 30 days prior to interview (1 = yes, 0 = no)	-0.96	0.172	-2.34	0.42
Interaction wave 2 interview \times surgery	-1.48	0.648	-7.84	4.88
Interaction wave 3 interview \times surgery	4.81	0.035	.33	9.28
Interaction wave 4 interview \times surgery	-5.86	0.084	-12.52	0.78

sistently *higher* CES-D scores across the interview waves than other CRC patients.

The model in Table 5 includes as additional predictors the *time-dependent* predictors (i.e., those that were measured again at each interview wave and thus can and do change from one interview wave to the next). Among them are marital status (2 patients became widowed over the observation period) and employment status (2 patients dropped employment and 14 resumed employment at later waves) and the indicators of the major type of treatment (surgery, chemotherapy, or radiation). Finally, there are the three self-report measures of symptoms and physical and social functioning.

Concerning marital and employment status, it is clear that they do not explain any additional variation in CES-D scores. Quite the opposite is true of the three quality-of-life indicators, e.g. the symptom count, and the two SF-36 subscales. All three have strong effects on the CES-D scores. For instance, the model suggests that for each additional three reported symptoms, the CES-D score is raised by more than a unit score ($3 \times 0.35 = 1.05$). Similarly, the two SF-36 scales, with standard scores ranging from 0 to 100, affect the CES-D scores in the expected direction. An increase in the physical functioning score by 20 points (indicating better physical functioning) lowers the CES-D score by 1, while an increase in the social functioning score by 20 points lowers the CES-D score by 1.2. When we look at the main effects for treatment variables, we first note that none of them is statistically significant. However, one two-way interaction term between the surgery and wave three indicators suggests that, having surgery before the wave 3 interview (only four cases in this sample) raises the depressive symptomatology score by 1.33 ($=4.81 + 0.06 - 3.54$). No other two-way interactions involving the wave indicators are significant. Finally, all main wave effects are statistically insignificant. (A main-effects model containing *only* the wave indicators, and no interactions with the dichotomous surgery indicator, shows no significant effect of either.) Thus, after controlling for all the other variables in the model, there is no remaining evidence of a decline in depressive symptomatology in any of the successive waves. On further examination, we dropped all of the time-dependent predictors one at a time, to see whether the 'wave effect' as seen in Tables 3 and 4 reappears. As it turns out, it is the symptom count included in the model shown in Table 5 that makes the 'wave effect' on depressive symptomatology disappear. In other words, the apparent decline in CES-D scores for CRC patients who remain in the study can be attributed to the improvement in the symptom experience of these survivors. A similar statement can be made with respect to the effects of surgery on patients' CES-D scores. When the symptom count is omitted from the model, the surgery effect is statistically significant, indicating that its effect on depressive symptomatology is captured (in-

directly) through the symptoms that follow the experience of surgery.

Discussion

More than 40% of the elderly CRC patients in our study had late-stage diagnosis, and some 60% also suffered from two or more chronic co-morbid conditions. Seen in this light, the mean CES-D score in this sample at wave 1 (10.2; 18.2% scored at 16 or above) is not especially high. Vernon et al. [34] reported that 24% of their CRC patients were clinically depressed). Hann et al. [10], in their study of women with breast cancer, whom they compared with a control group of healthy women, observed average CES-D scores of 10.9 and 8.1 for the two groups. A CES-D score of 16 is the most commonly used cutoff score in screening for depressed mood in general populations; however, among older persons a cutoff score of 20 is sometimes used to yield a higher accuracy for the diagnosis of major depression [24]. Thus, for the most part, the patients in our sample did not exhibit severe depressive symptoms at wave 1, and they improved somewhat over the course of the four waves.

With the strong effects of race, gender and social functioning on depressive symptoms, our findings reinforce the results of Vernon et al. [34], who found in their study of CRC patients that fewer sources of social contact and less satisfaction with them were associated with high CES-D scores. Research has identified the social environment as important for psychological balance in the elderly [30], and a consistent protective effect of spouse or children on depression has been reported [7]. It has also been shown in the literature on family support and caregiving for the elderly that elderly female and African American care recipients often receive less support than white male care recipients, who are the most likely to enjoy the support of a wife or daughter [32]. Not surprisingly, patients in our study who reported more limitations in their daily social activities with family and friends tended to be more depressed, and this effect was evident throughout the whole observation period. This finding has important implications for oncologists, gastroenterologists, and other health care professionals caring for elderly patients with CRC, as they have the responsibility to educate patients and their immediate families about the importance of patients' maintaining their usual social interactions with family and friends as much as possible. At the same time, physicians may also recommend participation in group interventions, which will allow patients to see how others cope with similar problems, encourage expression of feelings, and help to reduce psychological symptoms and social isolation [3, 6]. Particular attention should be paid to the needs of African American and female patients, as they appear more likely to need this type of assistance.

Cancer-related symptoms (other than obvious indicators of depression, such as mood changes, appetite loss, sleep problems, fatigue, and weakness) were significant determinants of depressive symptomatology over the course of all four waves. In fact, the improvement in reported symptoms among the cancer survivors can account for all of the modest decline in depressive symptoms over time. Thus, our findings confirm existing research evidence that symptoms may have profound consequences for cancer patients in terms of both functional and emotional status [16, 28].

We were a little surprised to find that our treatment indicators showed little effect on the patients' depressive symptomatology scores. The only exception to this rule was the increased depressive symptomatology score at the time of the wave 3 interview. All of these few late surgeries involved repeat surgeries, a circumstance that might have contributed to the patients' depressive symptomatology. Otherwise, we could not show any treatment effects except for those of surgery that operate indirectly through symptom experience. However, there is no doubt that the mental health of these elderly patients is closely tied to their symptom experience. Thus, symptom management and psychological care must be a foremost concern of oncologists, gastroenterologists, and other health care providers as they seek to maintain a reasonable quality of life for these suffering elderly patients.

Psychological functioning among cancer patients is often affected by functional status [27]. Our study again

confirms the important part that physical functioning plays in predicting depressive symptomatology over the course of the four waves.

Age did not prove to be a significant predictor of depressive symptomatology, although older patients generally reported lower levels of depressive symptomatology than younger patients. On the other hand, with a truncated age range of 65–93 and control variables representing the physical and health conditions of the patients, this is not a surprising finding.

In conclusion, the most significant findings of this study were that limitations in physical and social functioning and the number of cancer-related symptoms were the primary predictors of depressive symptomatology for these elderly CRC patients over the course of the 1st year after diagnosis. At a clinical level of patient care, these findings mandate early identification of psychosocial difficulties experienced, an individualized symptom management plan, and the application of other interventions, such as information giving, reassurance, and referral to other resources. Particular attention should be paid to the needs of African American and female patients, as they may be more likely to need assistance.

Acknowledgements This research was supported by grant #RO1 NR01915, "Family Home Care for Cancer – A Community-Based Model," funded by the National Institute for Nursing Research and the National Cancer Institute with Barbara A. Given, PhD, RN, FAAN, East Lansing, Michigan 48824 USA, as Principal Investigator. We would like to thank the many courageous patients who participated in this study, along with the medical centers and professional staff who encouraged them to participate.

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