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A Composite Measure of Personal Financial Burden Among Patients With Stage III Colorectal Cancer

Christine M. Veenstra, MD, MSHP*, Scott E. Regenbogen, MD, MPH†, Sarah T. Hawley, PhD, MPH‡, Jennifer J. Griggs, MD, MPH§, Mousumi Banerjee, PhD||, Ikuko Kato, PhD¶, Kevin C. Ward, PhD#, and Arden M. Morris, MD, MPH**

*Department of Internal Medicine, Division of Hematology/Oncology, University of Michigan, Ann Arbor

†Department of Surgery, Division of Colorectal Surgery, Center for Healthcare Outcomes and Policy, University of Michigan, Ann Arbor

‡Division of General Medicine, Cancer Surveillance and Outcomes Research Team, University of Michigan, Ann Arbor

§Department of Internal Medicine, Division of Hematology/Oncology, Center for Healthcare Outcomes and Policy, Cancer Surveillance and Outcomes Research Team, University of Michigan, Ann Arbor

||Department of Biostatistics, Center for Healthcare Outcomes and Policy, University of Michigan, Ann Arbor

¶Department of Pathology, Wayne State University, Detroit, MI

#Department of Epidemiology, Georgia Center for Cancer Statistics, Rollins School of Public Health, Emory University, Atlanta, GA

**Department of Surgery, Division of Colorectal Surgery, Center for Healthcare Outcomes and Policy, Cancer Surveillance and Outcomes Research Team, University of Michigan, Ann Arbor, MI

Abstract

Background—Despite improved survival with chemotherapy for stage III colorectal cancer (CRC), patients may suffer substantial economic hardship during treatment. Methods for quantifying financial burden in CRC patients are lacking.

Objective—To derive and validate a novel patient-reported measure of personal financial burden during CRC treatment.

Data Collection—Within a population-based survey of patients in the Detroit and Georgia Surveillance, Epidemiology and End Results regions diagnosed with stage III CRC between 2011

and 2013, we asked 7 binary questions assessing effects of disease and treatment on personal finances.

Data Analysis—We used factor analysis to compute a composite measure of financial burden. We used χ^2 tests to evaluate relationships between *individual* components of financial burden and chemotherapy use with χ^2 analyses. We used Mantel-Haenszel χ^2 trend tests to examine relationships between the *composite* financial burden metric and chemotherapy use.

Results—Among 956 patient surveys (66% response rate), factor analysis of 7 burden items yielded a single-factor solution. Factor loadings of 6 items were >0.4 ; these were included in the composite score. Internal consistency was high (Cronbach $\alpha = 0.79$). The mean financial burden score among all respondents was 1.72 (range, 0–6). The 812 (85%) who reported chemotherapy use had significantly higher financial burden scores than those who did not (mean burden score 1.88 vs. 0.88, $P < 0.001$).

Conclusions—Financial burden is high among CRC patients, particularly those who use adjuvant chemotherapy. We encourage use of our instrument to validate our measure in the identification of patients in need of additional financial support during treatment.

Keywords

colorectal cancer; chemotherapy; financial burden; finances; factor analysis

Thirty-five percent of colorectal cancer (CRC) patients are diagnosed with stage III disease.¹ Adjuvant 5-FU-based chemotherapy improves survival, and has become standard treatment.² Unfortunately, chemotherapy use may be associated with financial hardship.^{3–8} Patients may even choose to forego recommended cancer care because of prohibitively high costs.^{9,10} To help ensure that patients receive all recommended care, clinicians and policymakers should understand the extent of financial burden associated with chemotherapy use and identify patients at risk for substantial financial burden.

The primary aim of our study was to derive and validate a new patient-reported measure of personal financial burden in a large, population-based sample of geographically, economically, and racially diverse patients with stage III CRC. We then used the measure to evaluate the association of chemotherapy use and personal financial burden among these patients.

METHODS

Study Population

We identified all patients 21 years and older with pathologic stage III colon or rectal cancer reported to the Surveillance, Epidemiology and End Results cancer registries of tricounty metropolitan Detroit and the State of Georgia between August 2011 and March 2013. Patients were eligible for study recruitment within 3–12 months following surgical resection of CRC. Exclusion criteria included stage IV disease, change in diagnosis based on final histology, death before survey deployment, or residence outside the catchment area.

Data Collection

We notified physicians of our intention to contact study subjects. After a brief response period, subjects were invited to participate in the survey. A modified Dillman approach was used for recruitment.¹¹ Upon receipt of surveys, extensive data checks for logic, errors and omissions were performed and patients were contacted as necessary to obtain missing information.

The study protocol was approved by the institutional review boards of the University of Michigan, Wayne State University, Emory University, the State of Michigan, and the State of Georgia Department of Public Health.

Measures

The primary outcome in this study was personal financial burden, assessed by a series of 7 binary questions asking patients how CRC or its treatment affected their finances (Table 1). These measures were adapted from the National Consumer Bankruptcy Project¹² and have been used previously in our work.^{13,14}

As a secondary aim, we examined the association between personal financial burden and use of adjuvant chemotherapy. Additional covariates included Surveillance, Epidemiology and End Results catchment area, self-reported demographics (age at diagnosis, sex, race, and marital status), socioeconomic status (based on measures in the National Health Interview Survey), employment status, health insurance, health status, and comorbidities. Respondents with missing income data were grouped separately for covariate analysis.

Development and Validation of Composite Financial Burden Score

Factor analysis was performed on the financial burden items for all respondents. Using these results, we developed a composite measure of financial burden with a range of 0–6; higher scores denote increased financial burden. The composite measure was internally validated against a binary item on global financial burden (My illness has had no impact on my finances) and a single question about financial worry (How much do you worry about financial problems that have resulted from your colorectal cancer and its treatment). In accordance with our previous work,¹⁵ worry was measured using a Likert scale that we dichotomized into “low” and “high” (Table 1).

Statistical Analyses

We used *t* tests and ANOVA to evaluate associations between financial burden, use of chemotherapy, and other covariates.

Using factor analysis, we initially retained factors with Eigen values of >1.0. We used item loading values >0.4 for the final scale. Finally, we evaluated internal consistency with Cronbach α statistic.

We used the Mantel-Haenszel χ^2 trend test to validate the composite financial burden score against the summary financial burden and financial worry items, and to test the relationship between financial burden and chemotherapy use. All statistical tests were 2-sided; $P < 0.05$

was considered statistically significant. All analyses were conducted using SAS 9.3 (Cary, NC).

RESULTS

Study Sample and Response Rate

Among 1653 eligible patients, 119 (8%) could not be located and 488 (31%) did not return the survey, yielding 956 completed surveys (66% response rate).

Respondent Characteristics and Financial Burden

Relationships between mean financial burden and the demographics, socioeconomic factors, and health status of respondents are displayed in Table 2. After adjustment, mean financial burden was significantly higher in respondents who were younger, uninsured, unemployed, had lower income, or used chemotherapy.

Composite Financial Burden Scores

The mean financial burden score was 1.72 (SD = 1.83). The range was 0–6, and 366 (38%) respondents endorsed no measures of financial burden. A total of 277 (29%) reported 1–2 measures; 223 (23%) reported 3–4; 90 (9%) reported 5.

Item Characteristics

Characteristics of financial burden items are described in Table 3. The most frequently endorsed measure was “I cut down on expenses in general,” (48%). The least frequently endorsed was “I cut down on spending for health care for other family members” (5%). Inter-item correlations varied between 0.14 and 0.61.

Exploratory Factor Analysis

The principal factor analysis of the financial burden items suggested 1 underlying factor with Eigen value = 4.31 (Eigen value second factor = 0.62). Factor loadings varied between 0.38 and 0.79. The items demonstrated good internal consistency; Cronbach α = 0.79.

Confirmatory Factor Analysis

The items referred to as “burden items” represent inherently different types of financial hardship. Nondiscretionary spending is assessed by the items “I had to use savings,” “I had to borrow money or take out a loan,” and “I could not make payments on credit cards or other bills.” Loading values for these items were similar (0.72–0.79). Discretionary spending is assessed by the items “I cut down on recreational activities,” “I cut down on spending for food and/or clothes,” and “I cut down on expenses in general.” While spending on food/clothing could represent discretionary or nondiscretionary spending, depending on context, that item grouped with the discretionary items in the factor analysis (loading values 0.45–0.50). The item “I cut down on spending for health care for other family members,” had a loading value <0.4 (0.38) and was endorsed by only 5% of respondents. We omitted this item from the composite measure, without significant change in Cronbach α .

We considered a 2-factor structure including a composite variable of the 3 discretionary items and a composite variable of the 3 nondiscretionary items. However, confirmatory factor analysis did not support an improved scale with these composite variables and thus our final financial burden score was computed by summing responses to 6 burden items. This scale had an Eigen value = 4.06 suggesting 1 factor (Eigen value second factor = 0.39). Factor loadings ranged from 0.44 to 0.79. The items demonstrated good internal consistency (Cronbach α = 0.79).

Internal Validation

Thirty percent of respondents endorsed the item “My illness has had no impact on my finances.” Of these, 94% did not endorse any financial burden items (composite burden score = 0). Similarly, among 562 respondents (60%) who reported low levels of financial worry, 54% had a composite financial burden score of 0.

In general, constructs of worry and financial burden were closely associated: 70% of respondents had concordant worry and burden scores (Pearson Correlation Coefficient = 0.625, $P < 0.001$). Four percent had low worry but high burden score (3–6) and 26% had high worry but low burden score (0–2).

Financial Burden and Chemotherapy Use

Associations between individual measures of financial burden and chemotherapy use are shown in Figure 1. When compared with patients who did not use adjuvant chemotherapy, patients who used chemotherapy were more likely to use savings (36% vs. 21%; $P < 0.001$), borrow money or take out a loan (14% vs. 5%; $P = 0.002$), miss credit card payments (14% vs. 5%; $P = 0.002$), cut down on spending for food/clothes (33% vs. 15%; $P < 0.001$), cut down on recreational activities (39% vs. 16%; $P < 0.001$), or reduce general expenses (57% vs. 26%; $P < 0.01$).

The mean financial burden score for patients using adjuvant chemotherapy was 1.9 versus 0.9 for those patients who did not use chemotherapy ($P < 0.001$). The distribution of composite financial burden score by chemotherapy use is presented in Figure 2.

DISCUSSION

An estimated 137,000 Americans will be diagnosed with CRC in 2014; approximately half of these will receive chemotherapy. Although use of chemotherapy is associated with financial hardship, metrics to screen for financial burden are lacking. In our study of geographically, economically, and racially diverse patients with stage III CRC, we aimed to develop and describe a tool based on patient-reported data regarding the personal financial burden patients experience with use of chemotherapy. This tool can be used to identify patients at risk for financial burden and inform policy interventions to support these patients through cancer treatment. We found substantial financial burden among most respondents, with significantly higher burden reported by those who used chemotherapy.

Consistent with prior studies,^{3,4} younger respondents reported greater burden than older respondents. Because younger patients remain in the workforce during their cancer

treatment, they may face lost wages and opportunity costs.^{16–18} One fourth of respondents aged less than 50 and 14% of respondents age 50–64 reported that they were working at the time of CRC diagnosis, but were disabled when they completed the survey. Respondents with an annual household income of \$20,000–\$49,000 (roughly 100%–200% of the 2014 national poverty threshold) reported the highest levels of financial burden. These findings suggest that the young, working poor are a particularly vulnerable patient group. Policy changes to job support measures, such as mandatory paid sick leave and disability benefits, may help support such patients during CRC treatment.

There were several subgroups of respondents who reported high levels of worry about finances despite lower reported composite personal financial burden scores. These respondents tended to be racial minorities and have an annual household income <\$20,000. Our burden score may lack sensitivity to the socioeconomic hardships of these individuals who may not have personal savings, available credit, or discretionary spending to reduce in times of illness. Individuals with fewer means of compensating for financial losses may find some of the response items immaterial. Given that one quarter of our respondents reported an annual household income <\$20,000 and nearly 40% of US workers earned <\$20,000 in 2012,¹⁹ this could potentially affect a large population of CRC patients. Alternate measures of financial burden should be explored in this population.

Composite financial burden was particularly high among respondents in our study who used chemotherapy. These respondents were significantly more likely to endorse each individual financial burden item, compared with those who did not use chemotherapy. Nonadherence with recommended medications, including chemotherapy, and omission of essential medical care has been attributed to financial burden among cancer patients.^{20,21} Emotional distress and dissatisfaction with care also stem from financial burden,^{22,23} and all contribute to reduced quality of life.²⁴ Policy interventions to support patients receiving chemotherapy could include subsidies from pharmaceutical companies to offset copays or funds from hospitals and cancer centers to defray patient costs for parking and transportation.

Although our survey respondents included only patients with resected stage III CRC, the population-based nature of our study and the broad geographic and economic representation ensure that our findings can be applied to the general population of CRC patients and perhaps patients with other cancers as well. Although our results may reflect nonresponse bias, our response rate of 66% compares quite favorably to the response rates of other large, mailed surveys of CRC patients. There may be other dimensions to personal financial burden that our measure does not assess. However, our burden items are adapted from the well-known National Consumer Bankruptcy Project. Finally, a subjective measure of patient financial burden may be more difficult to interpret across studies than a dollar value such as out-of-pocket cost, however, dollar values may not convey the personal burden experienced by individuals. We would welcome future studies investigating the association between out-of-pocket costs and patient-reported financial burden.

In conclusion, we have developed a novel patient-reported measure of personal financial burden among a population-based sample of patients with stage III CRC. We present a 1-factor measure of personal financial burden, which may be a valuable tool to identify

patients at risk for increased burden. The greatest burden was endorsed by the younger working poor and by those respondents who used chemotherapy. These vulnerable patient groups may benefit from policy interventions to provide economic support as they undergo potentially life-saving cancer treatment.

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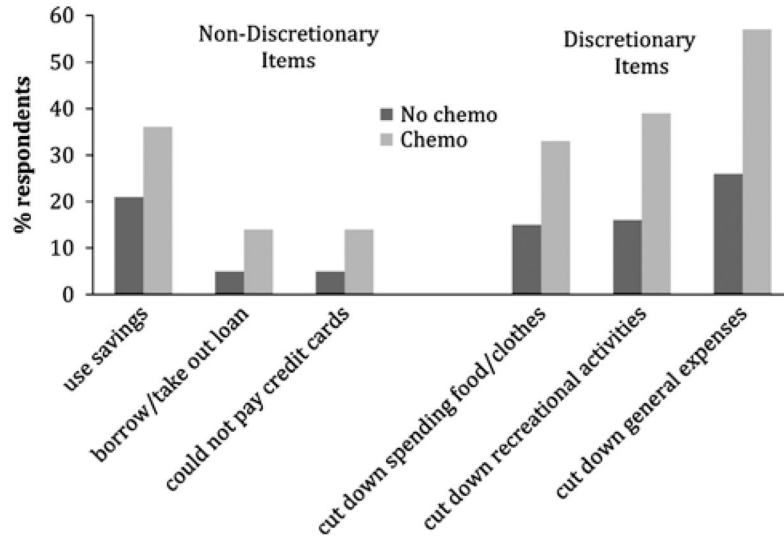


FIGURE 1. Patient report of individual personal financial burden items, by chemotherapy use. Those using chemotherapy were significantly more likely to endorse each item of financial burden (all $P < 0.01$).

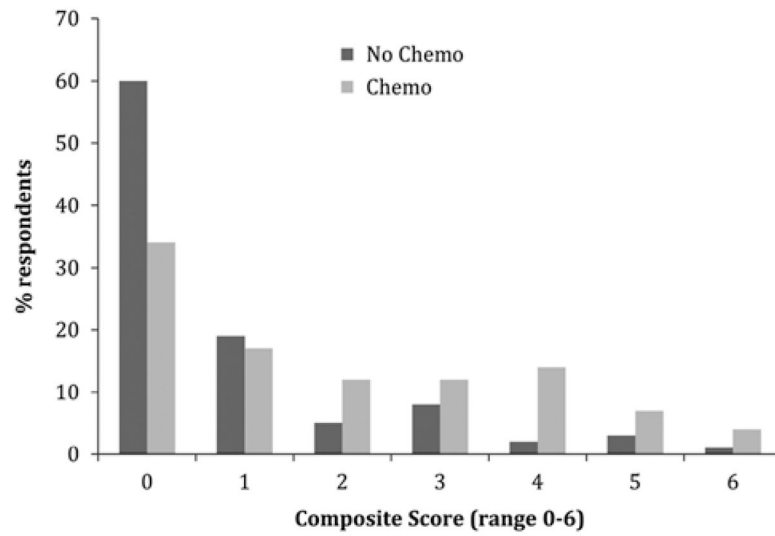


FIGURE 2.

Distribution of personal financial burden scores, by chemotherapy use. Those using chemotherapy had significantly higher scores and were less likely to report none of the items of personal financial burden ($P < 0.001$).

TABLE 1

Survey Items to Assess Financial Burden and Worry

Burden^{*}

We'd like to learn about how your colorectal cancer or treatment have affected your finances. Please check ALL of the responses below that apply.

- (1) I had to use savings.
- (2) I had to borrow money or take out a loan.
- (3) I could not make payments on credit cards or other bills.
- (4) I cut down on spending for food and/or clothes.
- (5) I cut down on spending for health care for other family members.
- (6) I cut down on recreational activities.
- (7) I cut down on expenses in general.

Worry[†]

How much do you worry about financial problems *that have resulted from your colorectal cancer and its treatment?*

1 Not at all	2	3	4	5 Very much
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* After factor analysis, the item “I cut down on spending for health care for other family members” was omitted from the composite measure of financial burden, resulting in a 6-item measure with a score range of 0–6 (higher scores denote increased financial burden).

† In accordance with our previous work, worry was dichotomized as low (1–3) or high (4–5).

TABLE 2

Respondent Characteristics and Reported Personal Financial Burden (N = 956)

Patient Characteristics	N (%)	Financial Burden (Mean ± SE)	P
SEER catchment area			< 0.001
Metropolitan Detroit	324 (34)	1.91 ± 0.09	
Georgia	632 (66)	1.35 ± 0.07	
Use of chemotherapy			< 0.001
No	144 (15)	0.88 ± 0.12	
Yes	812 (85)	1.88 ± 0.06	
Age at diagnosis			< 0.001
< 50	158 (17)	2.51 ± 0.16	
50–64	349 (37)	2.13 ± 0.10	
65–74	219 (23)	1.41 ± 0.11	
75+	230 (24)	0.88 ± 0.09	
Sex			0.385
Male	504 (53)	1.68 ± 0.08	
Female	440 (46)	1.79 ± 0.09	
Race			0.022
White	678 (71)	1.63 ± 0.07	
Black	220 (23)	1.92 ± 0.13	
Other/unknown	57 (6)	2.16 ± 0.26	
Marital status			0.012
Not married/partnered	382 (40)	1.54 ± 0.09	
Married/partnered	574 (60)	1.85 ± 0.08	
Education			0.247
< High school	152 (16)	1.66 ± 0.15	
High school	231 (25)	1.85 ± 0.12	
Some college	308 (33)	1.83 ± 0.11	
College grad+	247 (26)	1.57 ± 0.11	
Annual income			< 0.001
< \$20,000	165 (22)	1.70 ± 0.14	
\$20,000–\$49,000	256 (33)	2.31 ± 0.12	
\$50,000–\$89,000	208 (27)	1.86 ± 0.13	
\$90,000	140 (18)	1.42 ± 0.14	
Missing	187 (20)	1.03 ± 0.11	
Health insurance			< 0.001
Medicare	357 (38)	1.28 ± 0.09	
Medicaid	32 (3)	1.44 ± 0.31	
None	81 (9)	2.67 ± 0.22	
Other	163 (17)	1.84 ± 0.14	
Employer provided	313 (33)	2.00 ± 0.10	
Overall health			0.488

Patient Characteristics	N (%)	Financial Burden (Mean \pm SE)	<i>P</i>
Poor	61 (7)	1.72 \pm 0.22	
Fair	131 (14)	1.96 \pm 0.17	
Good	337 (36)	1.77 \pm 0.10	
Very good	274 (30)	1.68 \pm 0.11	
Excellent	134 (14)	1.57 \pm 0.15	
Comorbid conditions			0.212
None	238 (25)	1.91 \pm 0.12	
1	294 (31)	1.66 \pm 0.10	
2	424 (44)	1.67 \pm 0.09	
Employment status			< 0.001
Employed	236 (26)	1.81 \pm 0.11	
Unemployed	42 (5)	2.57 \pm 0.28	
Disabled	176 (19)	2.79 \pm 0.07	
Retired	409 (44)	1.18 \pm 0.24	
Homemaker	62 (7)	1.61 \pm 0.16	

Data shown are N (%).

P values are derived from *t* tests for groups of 2 and from ANOVA for groups of >2. Proportions may not add to 100% because of rounding or missing data.

SEER indicates Surveillance, Epidemiology and End Results.

TABLE 3

Characteristics of Personal Financial Burden Items From Exploratory Factor Analysis

Items	Frequency Endorsed by Respondents [N (%)]	Corrected Item–Total Correlation	Loading Value	Cronbach α (if Item Deleted)*
(1) I had to use savings	310 (34)	0.41	0.50	0.78
(2) I had to borrow money or take out a loan	124 (13)	0.45	0.45	0.78
(3) I could not make payments on credit cards	124 (13)	0.50	0.50	0.77
(4) I cut down on spending for food/clothes	286 (30)	0.66	0.79	0.73
(5) I cut down spending for health care for others	50 (5)	0.38	0.38	0.79
(6) I cut down on recreational activities	336 (35)	0.63	0.77	0.74
(7) I cut down on expenses in general	461 (48)	0.59	0.72	0.75

* Cronbach α statistic = 0.79 for the scale.