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Symptom Distress in Older Adults Following Cancer Surgery

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Abstract

Background—Symptom distress remains a significant health problem among older adults with cancer following surgery. Understanding factors influencing older adults' symptom distress may lead to early identification and interventions, decreasing morbidity and improving outcomes.

Objective—We conducted this study to identify factors associated with symptom distress following surgery among 326 community-residing patients ages 65 and older diagnosed with thoracic, digestive, gynecologic, and genitourinary cancers.

Methods—Secondary analysis using combined subsets of data from five nurse-directed intervention clinical trials targeting patients post-surgery at academic cancer centers in northwest and northeastern United States. Symptom distress was assessed by the Symptom Distress Scale at baseline, 3, and 6 months.

Results—A multivariable analysis, using Generalized Estimating Equations, showed symptom distress was significantly less at 3 and 6 months (3 months: $p < 0.001$, 6 months: $p = 0.002$) than at baseline while controlling for demographic, biologic, psychological, treatment, and function covariates. Thoracic cancer, comorbidities, worse mental health, and decreased function were, on average, associated with increased symptom distress (all $p < 0.05$). Participants ages 75 and older reported increased symptom distress over time compared with those ages 65 to 69 ($p < 0.05$).

Conclusions—Age, type of cancer, comorbidities, mental health, and function may influence older adults' symptom distress following cancer surgery.

Implications for Practice—Older adults generally experience decreasing symptom distress after thoracic, abdominal, or pelvic cancer surgery. Symptom management over time for those with thoracic cancer, comorbidities, worse mental health, decreased function, and ages 75 and older may prevent morbidity and improve outcomes of older adults following surgery.

Keywords

Cancer; Surgery; Older; Symptom Distress

Introduction

Older adults, ages 65 and over, comprise 60% of the 10.8 million persons living with cancer and 80% of all cancer deaths.^{1,2} Symptoms from both cancer and its treatment represent a major health problem among older adults, leading to delays in treatment and health resource

use.³ New management strategies, such as targeted pharmacotherapeutics and improved surgical techniques, have been introduced into the clinical setting to help alleviate symptoms. These strategies, though, are mainly tested among persons younger than age 65 and have the potential to cause unexpected reactions when prescribed or used among older adults.^{4,5} Hence, older adults' symptoms from cancer and its treatment continue to challenge clinicians and researchers.

Symptoms are characterized as multidimensional, arising from a physiological process from the cancer site and stage, and influenced by psychosocial factors including patients' perception of vulnerability, anxiety, and depressive symptoms.^{6,7} Experts describe symptoms in terms of frequency, intensity, and distress.^{8–10} Of these terms, symptom distress, defined as the degree of discomfort from the particular symptom, imparts the greatest information about the patients' experience and the meaning that the symptom holds for each individual.^{10–12}

Cancer treatments consists of surgery, chemotherapy, and radiation therapy, and each type or combination of treatments may impact patients' symptom distress. Despite a large body of literature addressing cancer treatment, the factors influencing symptom distress among older adults undergoing surgery remain unclear. Some study findings suggest that younger patients with cancer experience greater symptom distress than older adults.^{13,14} Other study findings show either no association¹⁵ or a positive association between age and symptom distress.¹⁶ However, these studies consisted of heterogeneous populations in terms of age and cancer treatment.

One study was conducted to examine the factors influencing older adults' symptom distress following breast cancer surgery. In this study, the researchers limited the study population to those ages 60 and older. The study findings demonstrated that symptom distress at hospital discharge is negatively correlated with age and positively correlated with education. At six months, married study participants report greater symptom distress.¹⁷ These findings support that limiting study populations to older adults may enable researchers to explicate factors influencing older adults' symptom distress following cancer surgery. The challenge of limiting study populations to older adults undergoing surgery is the lack of participation by patients ages 65 and older in clinical trials.^{4,5}

The purpose of this article is to report findings from a secondary analysis conducted to determine the influence of age categories 65 to 69, 70 to 74, and 75 and older on symptom distress among older adults undergoing thoracic, abdominal, and pelvic surgery. To do this, we combined data from five oncology nurse-directed clinical trials to increase the size of the study population and the power of the study to detect significant findings. The specific aims for this study were to describe: 1) older adults undergoing thoracic, abdominal, and genitourinary cancer, 2) the mean symptom distress by age category and type of cancer, and 3) the association of age categories with symptom distress after cancer surgery at the post-operative period (baseline), then at 3 and 6 months while controlling for demographic, biologic, psychological, treatment, and function covariates.

Design & Methods

Design

A secondary analysis was conducted using data from five nurse-directed randomized clinical trials investigating the effect of care provided by advanced practice nurses (APNs) after surgery. The Vulnerability/Risk/Human Response care model of nursing (VRHR) guided the selection of independent and dependent variables for this study.¹⁸ The model depicts the integrated function of the whole individual from a biopsychosocial view of individual

vulnerability (demographics, biologic, psychological) and environmental (treatment) factors that affect human responses (i.e. symptom distress).

The study was approved by Yale School of Nursing (YSN) Human Subjects Institutional Review Board. Informed consent was previously obtained from all patients during the parent studies, and study identification numbers were used in place of personal identifying data in order to protect the confidentiality of human subjects.

Data Source

The five clinical studies were conducted between 1983 and 2007 at academic cancer centers in the Northwest and Northeast United States. Complete details of these studies have been provided elsewhere.^{19–23} Patients were recruited during their hospitalization and baseline interviews conducted within 1 month after discharge except for study one. In study one, patients were recruited in the outpatient clinics after discharge and baseline interviews were conducted on average 60 days after surgery. The data collection times consisted of baseline (enrollment), and then 3 and 6 months after enrollment. Demographic data and comorbidities were recorded at baseline. Cancer site, stage, and treatment data were collected from treatment records and medical record audits. Symptoms, psychological, and function data were obtained from patient interviews at baseline, and 3 and 6 months. The types of cancers differed among studies. Study one's population consisted of patients with thoracic cancers. Study two and three populations were patients with heterogeneous cancers of breast, colorectal, head and neck, thoracic, prostate, gynecologic, bladder, pancreatic, esophageal, renal, and gastric. Study four targeted men with prostate cancer. The study five participants were women undergoing abdominal surgery for presumed gynecological cancers; however the final pathology showed ovarian, uterine, endometrial, and metastatic pancreatic cancers.

The studies were combined to increase the patient population, providing power to detect clinically meaningful changes over time. The procedures used to combine the studies were based on the literature addressing secondary analysis.^{24,25} We first mapped the selected variables across the five parent studies to examine and plan item compatibility using an excel spread sheet. This showed that all studies used similar demographic variables, count of comorbidities, and symptom measure. Multiple scales, though, were used to measure psychological profiles of patients.^{26–29} Each scale had one consistent measurement item: "blue or downhearted" and, thus, was used for this study. Studies 1, 2, 3, and 5 used a similar function measure, Enforced Social Dependency Scale (ESDS).³⁰ Researchers in Study 4 used the SF-36® Health Survey (SF-36) physical component summary measures to assess function.³¹

Due to advances in science, pathological reports varied in detail across the studies. For consistency, all pathological reports were analyzed, compared, and updated to the current classification and staging system published in the *AJCC Staging Manual Sixth Edition*³² and information from 2008 National Comprehensive Cancer Network (NCCN) website (<http://www.nccn.org/clinical.asp>). This review changed the stages of 12 study participants from early to late. These changes were reviewed and verified by a second independent coder.

Participant Selection

A total of 1,032 participants were enrolled among the five studies, in which 537 were aged 65 and over. Eighty five patients who were 65 and over died by the 6 month time period. Due to subject attrition, only 428 patients had symptom data collected for a minimum of two or more time points. We limited the study population to 326 subjects ages 65 and over diagnosed with digestive system, thoracic, gynecologic, and genitourinary sites treated

primarily with surgery with no other concurrent malignancy or other medical treatment, and minimum of two points of symptom assessment data collection. The rationale for limiting the study population to these cancer sites was that the majority of these cancers occur among older adults.³³ Furthermore, the surgery for these cancer sites usually involves an invasive procedure in the thorax, abdomen, or pelvis, influencing older adults' function and symptom distress. Among these 326 patients, 186 patients were listed as undergoing surgical resection of their tumors and three patients were treated with colonoscopies, biopsies, or lumpectomies. The target population for the five nurse-directed studies consisted of surgical cancer patients; we therefore assumed the remainder of the surgical data were either missing or not collected.

Main Outcome Measure

The main outcome variable was symptom distress, measured by the Symptom Distress Scale (SDS).¹² The SDS consists of 13 common symptoms of cancer patients: frequency of nausea, severity of nausea, appetite, insomnia, frequency of pain, severity of pain, fatigue, bowel pattern, concentration, appearance, breathing, outlook, and cough. Subjects rated their distress on a scale from 1 (low distress) to 5 (high distress). Total symptom distress is obtained by an unweighted sum of all items, resulting in scores ranging from 13 to 65. The SDS has demonstrated validity and reliability with reported Cronbach alphas ranging from 0.70 to 0.89.^{12,34}

Covariates

Demographic—The demographic variables for the current study were age, gender, race/ethnicity, marital status, employment, occupation, education, income, and living alone. These data were abstracted from the patient history forms and recorded on a standardized form. All subjects aged 65 and older during the 6 months of the study were included, and ages at 6 months were used for the analysis. Age categories typically used in gerontology research were initially used for the present study: 65 to 74, 75 to 84, and 85 years and over. A review of the univariate statistics of the demographics, however, revealed only 12 subjects (3.7% of population) in age category “age>85”. The categories, therefore, were collapsed to 65 to 69, 70 to 74, and 75 and over to provide balance for the statistical analysis.

Biologic—The biologic variables were cancer site, stage and comorbidities. The cancer site and stage data were obtained from the original study medical record audits. For the analysis, the cancer types were grouped based on the *AJCC Cancer Staging Manual, sixth edition* classification system,³² and categorized as digestive system (esophagus, gastric, colorectal, pancreatic), thoracic (lung), gynecologic sites (vulva, uterine, ovarian), and genitourinary sites (prostate, renal, renal pelvis and ureter, and bladder). These cancer categories are documented to have increased incidence in older adults.³³ We followed the precedent from original studies and used the same stage categories “early stage” and “late stage”. For all cancers except prostate, early stage was defined as stages I and II, and late stage was defined as stages III and IV. In prostate cancer, early stage was defined as I, II, and III, and late stage was defined as stage IV.

Comorbidity was defined as other preexisting health condition or disease outside the index cancer. Following procedures from the five original studies, all preexisting health conditions or diseases reported by the study participants were categorized as follows: Cardiovascular, respiratory, endocrine, eye/ear/nose/throat, mental, neurological, genitourinary, gastrointestinal, skin, cancer, injuries, infectious, and other. The empirical indicator was sum of comorbidities. Evidence from research studies support concurrent and predictive validity for count of disease as a measure of comorbidity.³⁵

Psychological—The psychological measures used in the five studies were SF-36 Mental Component Summary Scales, SF-12 Mental Component Summary Scales, Profile of Mood States, Mental Health Inventory 5-item version (MHI-5), and Center for Epidemiological Studies–Depression Scale (CES-D).^{26–29} Although multiple scales were used across studies, each had one consistent measurement item: “blue or downhearted”. The item “blue or downhearted” is reported to be a powerful, nonspecific detector of mental health disorders.²⁷ Hence, this item was used to represent mental health for the current study.

Treatments—Cancer treatment data were extracted from treatment records and medical record audits from the original studies. All patients in this study underwent surgery as their primary cancer treatment, but may have also received chemotherapy, radiation therapy, or any combination of the three. Hormone therapy was classified as chemotherapy in the original medical record audits and this definition was maintained for the present study. Three patients started chemotherapy greater than 3 months after enrollment. None were documented as receiving neo-adjuvant chemotherapy. “Nursing intervention” was defined as participation in an oncology Advanced Practice Nurse intervention, and operationalized as an assignment of study participants to receive or not receive the intervention. The measurement items for the study were APN intervention versus no APN intervention; Surgery alone; Surgery and Chemotherapy; Surgery and Radiation Therapy; Surgery, Chemotherapy, and Radiation Therapy.

Function—Patients’ function is strongly associated with symptoms,³⁶ and, hence, was included as a covariate in this study. Function was defined as the individuals’ actual performance of activities and tasks associated with their current life roles.^{37,38} Studies 1, 2, 3, and 5 used a similar function measure, ESDS.³⁰ Researchers in Study 4 used SF-36 physical components summary measures.³¹

The ESDS consists of two components: personal and social competence. Personal competence includes six activities of eating/feeding, dressing, walking, traveling, bathing, and toileting. Dependency in each activity was reported by the patient and rated by the interviewer on a 6-point scale. Scores for personal competence were summed and ranged from 6 to 36. Social competence consisted of home, work, and recreational activities, which were rated on 4-point scales, and the category communication, rated on a 3-point scale. Scores for social competence were summed and ranged from 4 to 15. Scores for personal and social competence were summed to generate a total dependency score ranging from 10 to 51, with higher scores reflecting greater dependency. The ESDS has demonstrated reliability (Cronbach’s alpha = .72 to .96) and validity.³⁰

The SF-36 is a 36-item survey of health status used to assess eight health concepts: physical functioning, role limitations due to physical health problems, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems, and mental health. The SF-36 has demonstrated item-internal consistency and item-discriminant validity. Reliability coefficients have ranged from a low of 0.65 to a high of 0.94 across scales (median=0.85).^{31,39} The measure has also demonstrated validity in discriminating between serious and minor medical conditions as well as psychiatric illnesses.³⁹

The mapping of variables described above demonstrated the function measures differed among studies: all studies used the ESDS except study 4, which measured function with the SF-36. The five studies were judged to consist of compatible study designs and methods. Hence, we combined the five studies based on methods described in the literature.^{40–42} The data were, therefore, prepared for this study by reverse coding the ESDS scores to attain consistent direction with the SF-36. The data were then converted to standardized norm-based scores (mean=50, standard deviation=10) using 0–100 metric and z scores. SF-36

scores were converted to norm-based scores using Quality Metric Health Outcomes Scoring Software 2.0 (QualityMetric Inc., Lincoln, RI).

Statistical Analysis

The outcome variable for the analysis was symptom distress. Descriptive statistics were conducted to determine the mean symptom distress score by age category and cancer site. Multiple linear regression analysis was then used to investigate whether differences in symptom distress across age categories were statistically significant while controlling for demographic, biologic, psychological, treatment, and function co-variables. The models were estimated using Generalized Estimating Equations (GEE) with an unstructured working correlation matrix for greatest flexibility to account for the correlation of observations over time. Dummy indicators were used to study time and interactions between time and age categories to examine time trends on the effects of age categories. The criteria for statistical significance was $p < 0.05$.

Sixty-one of the 326 patients did not have complete data, so 265 patients were included in the multivariable analysis. An inverse probability of censoring weighted estimator was used due to the rate of attrition and incomplete data over the three waves of data. To implement this method, contributions to the standard GEE fitted model were weighted inversely by the probability of not dropping out.^{43,44} Such inverse probability weighting accounts for data that is potentially missing at random (MAR), which is a less stringent assumption than the missing completely at random (MCAR) assumption of the unweighted GEE-fit estimators.

Results

Patient Characteristics

The mean age of study participants was 71.8 (SD=5.4) and most study participants ages ranged from 65 to 69 (N=147, 45.1%). Patients were balanced across Digestive (N=73, 22.4%), Thoracic (N=90, 27.6%), Gynecologic (N= 75, 23.0%), and Genitourinary Cancer Sites (N=88, 27.0%). At baseline, the majority of patients had 3 or more number of symptoms (N=206, 63.8%) and the mean mental health score was 3.9 (SD=1.1, range 1–5 with 5 representing better health).

Mean Symptom Distress Scores by Age Category and Cancer Site

Mean symptom distress scores at each data collection time were calculated by age category and cancer site (See Table 2, Figure 1, and Figure 2). Patients with highest symptom distress at baseline were thoracic cancer patients ages 65 to 69 (mean=29.9, n=45), whereas patients with genitourinary cancer ages 70 to 74 had the lowest symptom distress (mean=24.8, n=30). At 3 months, patients 75 and older with digestive cancer reported the highest symptom distress (mean=26.0, n=24) compared with patients ages 65 to 69 with genitourinary cancer (mean=17.6, n=48). Patients ages 75 and older with thoracic cancer reported the highest symptom distress (mean=26.7, n=15) compared with patients 70 to 74 with genitourinary cancer (mean=17.0, n=24).

Association of Age Categories with Symptom Distress

We explored the association of age categories with symptom distress while controlling for demographic, biologic, psychological, treatment, and function co-variables at the postoperative period (baseline), then at 3 and 6 months (See Table 3). The findings showed symptom distress decreased significantly over time, reflecting a typical post-operative course (3 months: -2.636 , 95% CI -4.142 to -1.130 , $p < .001$; 6 months: -2.566 , 95% CI -4.181 to -0.951 , $p = .002$).

Our analysis showed significant relationships among cancer site, mental health, and function. Compared with those diagnosed with genitourinary cancers, patients with digestive, thoracic, and gynecologic cancers had significantly increased symptom distress (Digestive: $\beta=2.827$, 95% CI 1.297 to 4.357, $p<.001$; Thoracic: $\beta=4.453$, 95% CI 2.602 to 6.303, $p<.001$; Gynecologic: $\beta=2.221$, 95% CI 0.312 to 4.131, $p=.023$; Genitourinary: Reference) (See Figure 1). In addition, those with better mental health reported less symptom distress ($\beta=-1.337$, 95% CI -1.772 to -0.902 , $p<.001$). Worse function was also associated with increased symptom distress ($\beta=-0.329$, 95% CI -0.393 to -0.265 , $p<.001$).

Our analysis demonstrated other statistically significant relationships. Patients with three or more comorbidities reported increased symptom distress ($\beta=1.766$, 95% CI 0.051 to 3.481; $p=.044$). The interaction term of age and time was also significantly associated with symptom distress; participants ages 75 and older reported greater symptom distress over the six month period than patients ages 65 to 69 ($\beta=2.491$; 95% CI 0.012 to 4.969; $p=.049$). This was also reflected in a graph of the mean number of symptoms over time (See Figure 2).

Conclusions

As the population ages, greater numbers of older adults may be candidates for cancer surgery, yet this population remains understudied due to lack of accrual to clinical trials.^{4,5} We conducted a secondary data analysis of study participants aged 65 and older who underwent thoracic, abdominal, and pelvic cancer surgery to better understand factors influencing the symptom distress experienced by older adults. Our analysis suggests that, on average, our study population experienced a typical post-operative pattern of decreasing symptom distress over the 6 month period after surgery even though over half of the study population received adjuvant treatment.

Furthermore, our analysis found several factors that were associated with increased symptom distress. Patients with heightened symptom distress also experienced worse mental health and decreased function. Patients who were diagnosed with thoracic, digestive, and gynecologic cancers experienced greater symptom distress than those diagnosed with genitourinary cancers. Our findings also demonstrated that patients reporting three or more comorbidities experienced greater symptom distress than those with no comorbidities. In addition, study participants aged 75 and older experienced on average greater symptom distress over the 6 month period of the study than study participants aged 65 to 69.

Previous studies support several of our findings. Earlier research has demonstrated that site of cancer, particularly thoracic cancer, and increased comorbidity burden are significantly associated with increased symptom distress.^{45,46} Other researchers have reported that mental health is significantly and negatively correlated with symptom distress among older women with and without breast cancer.⁴⁷

Some of our findings, though, contradict previous studies. In our study, participants ages 75 and older reported greater symptom distress at six months than their younger counterparts. This finding differs from previous studies that show younger patients with cancer report greater symptom distress than older patients.^{13,14} We also found that type of treatment (surgery, surgery plus radiation therapy, surgery plus chemotherapy, surgery plus chemotherapy and radiation therapy) was unassociated with symptom distress. In contrast, previous researchers have reported that patients receiving adjuvant therapy following surgery experience greater symptom distress than those not receiving adjuvant therapy.⁴⁸ The explanations for the difference in our findings from previous studies may include that we limited the patient population to those ages 65 and over and to those who were primarily treated with thoracic, abdominal, or pelvic cancer surgery.

Clinical Implications

Our findings suggest that older adults on average experience a typical post-operative course with decreasing symptom distress over time. Although older adults are a heterogeneous population, there are some who appear to be at risk for increased symptom distress beginning in the post-operative period and extending through adjuvant cancer therapy. These patients include those diagnosed with thoracic or digestive cancers. Patients ages 75 and over may also be at risk for greater symptom distress at 6 months after surgery than their younger counterparts. The adoption of increasing appointments at more frequent intervals after surgery for patients 75 years and older may limit symptom distress and prevent potential complications requiring subsequent hospitalizations. Furthermore, frequent appointments provide time for clinicians to educate patients and caregivers about the importance of prompt reporting of escalating symptom distress that may signal changes in the patient's status. Other clinical interventions that could help ameliorate older adults' symptom distress include monitoring for changes in mental health and function.

Research Implications

As the population ages, surgery for older adults is becoming an accepted practice.⁴⁹ Greater numbers of older adults will become candidates for cancer surgery. Hence, more research is needed to clarify the relationship between age and risk for increased symptom distress following surgery. For example, clinical studies are needed to examine the interactions of age, type of comorbidity, and site of cancer surgery that may increase older adults' risk for adverse outcomes. In addition, more studies are needed to test novel interventions to alleviate symptom distress among older adults following surgery. For example, nurse-directed clinics associated with oncology practices could test the use of newly developed telehealth interventions to facilitate older adults' and caregivers' reporting of escalating symptom distress.⁵⁰

Strengths and Limitations

The strength of our study comes from combining subsets of patients aged 65 and older from five nurse-directed clinical trials of community residing patients with cancer. The combining of data subsets increased the number of patients available for analysis, resulting in greater power of the study to detect significant findings. This also increased the generalizability of our findings. We also avoided the challenge of recruiting older adults to clinical trials. Despite the increased number of study patients, only 12 patients were ages 85 and above. Thus, the relationship of age and symptom distress in the oldest adults with cancer remains understudied.

Our study has several limitations. Combining five oncology nurse-directed clinical trials conducted over a 25 year period may have introduced heterogeneity. Changes in symptom management, such as better medications for nausea and increased imaging, over the past 25 years have been introduced over this time period. We instituted methods, though, to decrease the heterogeneity of combined studies. We used studies similar in design and methods, updated cancer stage data, and included the nurse intervention as a covariate in the multivariable model.

The use of secondary data and combining datasets influenced the choice of measures for the covariates mental health and functional status. For mental health, the five parent studies used differing mental health scales across studies. We found one consistent mental health indicator-feeling "blue/downhearted". In the psychometric studies of the MHI-5, researchers found this item to be a powerful, nonspecific detector of mental health disorders.²⁷ For function, the measures differed among studies; all studies used the ESDS except study 4, which measured functional status with the SF-36. This necessitated standardization of the

two measures in order to combine the studies. Despite the potential heterogeneity that these adjustments may have introduced into the study, both covariates demonstrated strong association with symptom distress.

Conclusion

We conducted a study to explore factors related to symptom distress over time in older adults undergoing thoracic, abdominal, and pelvic cancer surgery. Our analyses generated findings that showed symptom distress significantly decreased over 6 months after cancer surgery, reflecting a typical post-operative course. Factors related to increased symptoms distress following surgery were type of cancer, number of comorbidities, mental health, and function. Our findings also showed that patients aged 75 and older experienced greater symptom distress over time than those aged 65 to 69. Patients who are diagnosed with digestive or thoracic cancers, have increased comorbidity burden, report worse mental health, or experience decreased function should undergo heightened surveillance for increasing symptom distress leading to morbidity. More research, though, is needed to clarify the relationship between age and symptom distress over time.

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Figure 1.
Mean Symptom Distress Over Time by Type of Cancer^a
^aHigher number represents greater symptom distress.

Figure 2.
Mean Symptom Distress Over time By Age^a
^aHigher number represents greater symptom distress.

Table 1

Patient Characteristics (N=326)

Variable	Number	Percent
Mean Age	Range	
71.8 ± 5.4	(range 65 – 93)	
Age		
65 to 69	147	45.1
70 to 74	108	33.1
Over 74	71	21.8
Gender		
Male	162	49.7
Female	161	49.4
Race/Ethnicity		
White	247	75.8
Black/Other	57	17.5
Marital Status		
Married/Living With Partner	199	61.0
Not Married	127	39.0
Employment Status		
Working	54	16.6
Not Working/Retired/Unemployed	272	83.4
Education		
Grades 1–8	29	8.9
Grades 9–12	151	46.3
Over 12	146	44.8
Income		
\$0 to \$19,999	105	32.2
\$20,000 to 39,999	67	20.6
\$40,000+	80	24.5
\$Unknown	74	22.7
Lives Alone		
Yes	89	27.3
No	237	72.7
Cancer Site		
Digestive	73	22.4
Thoracic	90	27.6
Gynecologic	75	23.0

Variable	Number	Percent
Genitourinary	88	27.0
Stage		
Early Stage	172	52.8
Late Stage	117	35.9
Unknown Stage	37	11.3
Comorbidities		
0	23	7.1
1	57	17.5
2	65	19.9
3 or more	155	47.6
New Diagnosis versus Recurrent Disease		
New Diagnosis	276	84.7
Recurrent	45	13.8
Number of symptoms at baseline		
None	34	10.5
One symptom	44	13.6
Two symptoms	39	12.1
Three or more symptoms	206	63.8
Mental Health (Scale 1 to 5, with 5 representing better mental health)	Mean=3.9 ± 1.1	Range 1 to 5
Treatment		
Surgery	152	46.6
Surgery + Chemotherapy	103	31.6
Surgery + Radiation Therapy	30	9.2
Surgery+Radiation	41	12.6
Therapy+Chemotherapy		
APN Intervention Group		
Yes	153	46.9
No	173	53.1

Table 2

Mean Symptom Distress Scores by Age Category and Cancer Site

	Baseline Mean(SD)	3 Months Mean(SD)	6 Months Mean(SD)
Digestive			
65 to 69	27.7 ± 7.4 (n= 22)	20.3 ± 6.2 (n=21)	19.7 ± 7.6 (n=16)
70 to 74	26.1 ± 5.4 (n=27)	22.7 ± 5.2 (n=27)	23.6 ± 7.0 (n=25)
75 and over	28.0 ± 7.6 (n=24)	26.0 ± 8.8 (n=24)	23.3 ± 7.2 (n=17)
Thoracic			
65 to 69	29.9 ± 7.9 (n=45)	25.2 ± 5.9 (n=41)	25.7 ± 9.5 (n=40)
70 to 74	27.9 ± 8.1 (n=29)	23.8 ± 8.2 (n=28)	23.7 ± 7.6 (n=23)
75 and over	26.6 ± 9.8 (n=15)	23.0 ± 6.2 (n=16)	26.7 ± 10.0 (n=15)
Gynecologic			
65 to 69	29.0 ± 8.3 (n=30)	23.2 ± 6.4 (n=28)	21.0 ± 8.1 (n=23)
70 to 74	29.3 ± 7.2 (n=21)	23.4 ± 6.4 (n=22)	21.4 ± 6.4 (n=21)
75 and over	26.7 ± 7.5 (n=23)	19.5 ± 5.0 (n=23)	20.8 ± 6.2 (n=21)
Genitourinary			
65 to 69	24.9 ± 7.9 (n=49)	17.6 ± 6.2 (n=48)	17.4 ± 5.2 (n=44)
70 to 74	24.8 ± 7.2 (n=30)	18.7 ± 5.2 (n=29)	17.0 ± 5.1 (n=24)
75 and over	26.4 ± 6.5 (n=8)	20.8 ± 9.4 (n=8)	21.5 ± 6.4 (n=6)

Table 3

Relationship Between Symptom Distress and Age Over Time While Controlling for Demographics, Functional Status, Biological, Treatment, and Mental Health Variables (N=265)^a

Parameter	Estimate(SE)	95% CI	P Value
Age 65 to 69	Reference	Reference	Reference
age 70 to 74	-0.661 (0.956)	-2.535 1.213	.489
Age 75 and over	-2.170 (1.606)	-4.445 -0.105	.062
Time			
Baseline	Reference		
3 months	-2.636 (0.769)	-4.142 -1.130	<.001
6 months	-2.566 (0.824)	-4.181 -0.951	.002
Age x Time			
Age 65–69 x 3 months	Reference		
age 70–74 x 3 months	1.052 (1.107)	-1.118 3.221	.342
age 75 over x 3 months	1.451 (1.129)	-0.762 3.663	.199
Age 65–69 x 6 months	Reference		
age 70 to 74 x 6 months	0.803 (1.128)	-1.408 3.014	.476
age 75 over x 6 months	2.491 (1.265)	0.012 4.969	.049
Cancer Site			
Digestive	2.827 (0.781)	1.297 4.357	<.001
Thoracic	4.453 (0.944)	2.602 6.303	<.001
Gynecologic	2.221 (0.974)	0.312 4.131	.023
Genitourinary	Reference		
No comorbidities	Reference		
One comorbidity	-0.073 (0.956)	-1.947 1.801	.939
Two comorbidities	1.061 (0.956)	-0.836 2.957	.273
Three or more comorbidities	1.766 (0.875)	0.051 3.481	.044
Mental Health	-1.337 (0.222)	-1.772 -0.902	<.001
Function Score	-0.329 (0.033)	-0.393 -0.265	<.001

^aThe analysis was conducted using age and type of cancer as main variables of interest while controlling for demographic, biologic, psychological, treatment, and function co-variables. Only significant results are shown in this table.