Severe functional limitation due to pain & emotional distress and subsequent receipt of prescription medications among older adults with cancer

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Abstract

Background: Certain cancer types and subsequent treatment can cause or worsen pain and emotional distress, leading to functional limitation, particularly among a growing population of older adults with cancer..

Methods: We constructed a national sample of older adult Medicare beneficiaries with cancer using the 2007– 2012 Surveillance, Epidemiology and End Results (SEER)-Medicare Health

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Outcomes Survey (MHOS) database linked to Medicare Part D enrollment and prescription claims data. MHOS survey responses described functional limitations due to pain and emotional distress. Using multivariable logistic regression, we estimated the association between participant characteristics and patient-reported functional limitation due to pain and emotional distress and subsequent prescription medication use.

Results: Among 9,105 older adults with cancer, aged 66–102 years (y), 68.6% reported moderate to severe functional limitation due to pain, and 48.3% reported moderate to severe functional limitation due to emotional distress. Nearly 10% reported severe functional limitation due to co-occurring symptoms of pain and emotional distress. Significant predictors of severe functional limitation due to co-occurring symptoms included age 80y (ref: 66–69y, adjusted relative risk (aRR): 1.74; 95% confidence interval (CI) 1.39–2.18, p<.001), stage IV disease at diagnosis (ref: stage I, aRR: 2.08; CI 1.52–2.86, p<.001), and lung cancer (ref: breast cancer, aRR: 1.84; CI 1.30–2.61, p<.001). Among 892 participants reporting co-occurring symptoms, 32.5% received neither pain nor emotional distress prescription medication.

Conclusions: Functional limitation due to pain and emotional distress persist among older adults with cancer, particularly octogenarians. Efforts to identify and target unmet supportive care needs to maintain functional independence are needed.

Introduction

Loss of functional independence, termed functional limitation, is a major concern among older adults with multiple chronic diseases including cancer.[1] Cancer and cancer treatment can lead to functional limitation among older adults with up to 40% of older adults experiencing functional decline after a new cancer diagnosis.[2] Functional limitation among older adults with cancer is increasingly important as older adults are the fastest growing demographic in the United States and worldwide.[3,4] In addition, by 2030, nearly two-thirds of all cancer diagnoses will be among older adults,[5,6] rendering the problem of functional limitation an important area of study in a growing geriatric oncology population.

Certain cancer types and subsequent treatment can cause or worsen pain and emotional distress, leading to functional limitation, which may or may not improve with cancer treatment. Among patients of all ages with cancer, studies have highlighted the high prevalence of pain and emotional distress. A recent meta-analysis found that 38% of patients with cancer report moderate to severe pain, with the number rising to 66.4% for patients with advanced, metastatic, or terminal cancer.[7] Moreover, cancer-associated pain is significantly associated with higher levels of emotional distress.[8,9] Previous studies using the 36-item Short Form Health Survey (SF-36) to examine patterns of pain and emotional distress among older adults have shown that pain and emotional distress were notable concerns for this population.[10] Despite its importance, patterns of functional limitation due to pain or emotional distress and the co-occurrence of pain and emotional distress is underreported in older adults with cancer. Prior studies focused on older adults and the

development of functional limitation due to pain but were not cancer-specific. [11,12] There is a lack of data describing the prevalence, disease, and patient-related factors associated with downstream functional limitation related to pain and emotional distress specifically among older adults with cancer. Furthermore, most studies focus on either pain or emotional distress separately rather than the co-occurrence of both pain and emotional distress. The co-occurrence of symptoms is common among adults both with[13,14] and without cancer[15]; and can great affect quality-of-life[16] even more so than a single symptom. To better target symptom management, we need to understand the extent to which the co-occurrence of pain and emotional distress limit function among older adults with cancer and to identify the predictors of severe functional limitation.

With ongoing efforts to improve the quality of cancer care, it is also important to examine older adults' use of prescription medication targeted at the management of pain and emotional distress. A number of studies have reported on receipt of supportive care medications, including opioids, non-opioids, antidepressants, and sleep aids by older adults with cancer.[17–24] However, relatively few studies have linked medication use to patient-reported symptoms (i.e. pain)[25], and to our knowledge, no published study has linked prescription medications with self-reported functional limitation due to co-occurring symptoms. Patient-reported symptoms and prescription medication claims data are usually analyzed separately. Characterization of patient-reported symptoms with subsequent prescription medication claims data can highlight which older adults are receiving pharmacologic intervention for this understudied and important patient-reported outcome: functional limitation. In addition, determining which characteristics are associated with severe functional limitation could help clinicians determine which older adults are likely to be at risk for severe symptomatology and hence, provide clinicians with the opportunity to intervene.

In this study, we describe both the prevalence and predictors of functional limitations due to pain, due to emotional distress, and co-occurring pain and emotional distress among older adults with cancer. In addition, we use linked Medicare Part D claims data to describe prescription medication use associated with patient-reported functional limitation.

Methods

Data

We used data from the linked Surveillance, Epidemiology and End Results (SEER)-Medicare Health Outcomes Survey (MHOS)[26], with a novel linkage to Medicare Part D claims. SEER provides detailed cancer registry data from 19 regions, including cancer type(s), stage, histology, date of diagnosis, and initial treatment modalities (surgery or radiation only). The MHOS includes self-reported information on sociodemographic characteristics, and responses to questions in the Veteran's RAND 12-item survey[27,28], in addition to selected questions related to health status. It is administered annually to a random sample of Medicare beneficiaries enrolled in each Medicare Advantage plan with a minimum of 500 enrollees. The SEER-MHOS represents a linkage for beneficiaries with a SEER-reported cancer who responded to an MHOS survey. Medicare Part D prescription drug claims for the period from 2007 through 2012 were linked for Part D enrolled MHOS

respondents in the database. Part D claims provide detailed information on medications prescribed and filled, fill dates, route, strength, quantity, and days supplied for all oral prescription drugs covered by Medicare. Part D claims do not include medications obtained over-the-counter. Part D enrollees are not permitted to use supplemental coverage, patient assistance provided by industry or coupons, hence, these sources should not affect reliability of claims data.

Sample selection and characterization

We selected Medicare beneficiaries in the SEER-MHOS dataset who had a first and only primary cancer, invasive disease (Stages I-IV, with the addition of Stage 0 breast cancer), diagnosed between January 2003 and December 2012 (up to 5 years prior to first MHOS survey). Beneficiaries had to complete at least one MHOS survey between January 2008 and December 2012 within 5 years of their cancer diagnosis. We excluded observations with an unknown month of cancer diagnosis, cancer diagnosis first reported on death certificate or on autopsy, age 65 years or younger at MHOS survey date, and without continuous enrollment in Medicare Parts A, B, & D or Medicare Advantage & Part D during the 12 months pre- and post- the MHOS month or until death.

Participant sociodemographics were measured based on MHOS responses (age, race/ethnicity, sex, marital status, educational attainment) or linked at the zipcode level (percent of the population living in poverty, 4 regions as defined by the U.S. Census Bureau). Chronic health conditions were self-reported on a condition checklist included in the MHOS. Characteristics of the cancer (type, stage at diagnosis, and initial therapy) were reported as part of the SEER registry data. Current receipt of cancer therapy was self-reported on the MHOS for only breast, prostate, lung, and colorectal cancers. We captured initial treatment with radiation or surgery available through SEER; systemic treatment information is not available. Medicare/Medicaid dual enrollment was reported as part of the Medicare enrollment data.

Outcome Measures

The main outcome measures were self-reported activity limitation due to pain (pain interference) or emotional distress (emotional interference). Pain interference was measured based on the bodily pain subscale of the VR-12, based on responses to the MHOS question, "During the past 4 weeks, how much did pain interfere with your normal work (include both work outside the home and housework)?" This question is part of The Veterans RAND 12 Item Health Survey (VR-12)[29], a patient-reported global health measure. We grouped the responses into three levels: Little/None (Not at all; a little bit); Moderate (some of the time); and Severe (quite a bit, extremely). Emotional interference was measured using the Role-Emotional subscale[29] based on responses to two MHOS questions, "During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious): (1) accomplished less than you would like; or .... (2) didn't do work or other activities as carefully as usual." For each item, we grouped the responses into three levels: Little/None (none of the time; a little of the time); Moderate (some of the time) and Severe (most of the time, or all of the time). Patients' functional limitation due to emotional distress was

categorized based on a hierarchy: they were classified as having severe functional limitation if they answered either of these emotional distress MHOS questions with the "severe" answer; they were assigned to the moderate category if they answered either question with the "moderate" answer; and they were assigned to the little/none category if they did not meet either of the above criteria. For regression analyses, responses were grouped into two levels of activity limitation for pain and emotional distress, respectively: severe or not severe (moderate/little/none). We also constructed an indicator for respondents who reported severe activity limitation from co-occurring pain and emotional distress dichotomized as "severe" limitation in both pain and emotional distress compared with not "severe" for both types of functional limitation.

We also assessed the receipt of prescription medications for treatment of pain or emotional interference as of the MHOS survey date and the following three months. We categorized pain medications by: opioids, non-steroidal anti-inflammatory drugs (NSAIDs), local anesthetics, antiepileptic and selected tricyclic antidepressants commonly used in pain management. We categorized emotional symptom medications by antidepressants (excluding those already assigned to pain management), anxiolytics/sedatives, and antipsychotics. We identified relevant individual medications for pain and emotional distress based on input from the literature,[23,30] clinical guidelines,[31] and input from palliative care clinicians on the research team (Table S1). Once we identified the medications, we searched Part D claims for the study sample to identify the relevant generic drug names, including combinations identified by our clinical team. Indicators for individual drugs were combined to construct indicators for any pain or emotional distress medication, by category, and category combinations.

Analysis

We used bivariate analysis with chi-squared statistics to describe the unadjusted associations between type and degree of functional limitation and beneficiary characteristics. We used multivariable logistic regression analysis to test for associations between severe functional limitation and covariates of interest in three distinct models. Our first model evaluated severe functional limitation due to pain, a second model estimated severe limitation due to emotional distress, and a third model estimated severe limitation due to both pain and emotional distress. Covariates of interest included age, stage of cancer, and cancer type. For each model, we included covariates associated with hypothesized associations or that were significant in the bivariate analysis; we assessed the significance of the relative risk and used predicted margins to report on levels of functional limitation adjusted for covariates. As a subset analysis, to determine the effect of current treatment on function, we limited our sample to patients with the four cancer types that included information on receipt of current cancer therapy and added that covariate to the multivariable regression models. Hosmer-Lemeshow[32] and C-statistics were used to determine model goodness-of-fit. Lastly, we determined whether any medication was used to manage pain or emotional distress, and the types of medications used by type and degree of functional limitation.

All statistical tests were two-sided with alpha = .05. All analyses were performed using SAS version 9.4 and STATA version 15.

As per federal regulation 45 CFR 46.101(b)(4), the Yale Human Investigation Committee determined that this research was exempt from further review..

Results

We identified 9,105 Medicare beneficiaries with prostate (30.7%), breast (19.2%), colorectal (10.5%), lung (6.4%) or other (33.2%) cancer between 2007 and 2012. The mean age was 75 years (range: 66–102 years); 23.9% of the sample was 80 years, 44.4% were female, 24.9% had less than a high school education, and the majority were non-Hispanic white race (Table 1; Additional patient characteristics available in Table S2).

Functional limitation due to pain

Nearly 70% of beneficiaries (68.6%) reported functional limitation due to pain, with 46.0% reporting moderate functional limitation and 22.6% reporting severe functional limitation due to pain. Overall, the highest reported rates of severe limitation due to pain were among individuals 80 years of age (28.9%), female (25.9%), with lung cancer (37.1%), stage IV (32.8%) at diagnosis, comorbid depression diagnosis (53.0%) and less than a high school education (33.3%) (P<.01, Table 2).

Functional limitation due to emotional distress

Almost half of the sample (48.3%) reported functional limitation due to emotional distress, with 33.6% of those cases reporting moderate functional limitation and 14.7% reporting severe functional limitation. The highest rates of severe limitation due to emotional distress were among adults 80 years of age (20.4%), with lung cancer (27.2%), stage IV at diagnosis (25.2%), depression (49.8%), and less than a high school education (25.1%) (unadjusted, P<.01, Table 2).

Functional limitation due to co-occurrence of pain and emotional distress

Nearly 10% of the sample reported severe limitation due to both pain and emotional distress. The characteristics significantly associated with patient-reported functional limitation due to severe pain co-occurring with severe emotional distress were most similar to those associated with emotional distress only (80 years of age, lung cancer, stage IV at diagnosis, depression, and less than a high school education; unadjusted, P<.01, Table 2).

Factors associated with functional limitation

In multivariable regression models, significant predictors of severe functional limitation due to co-occurring symptoms included age 80y (ref: 66–69y, adjusted relative risk (aRR): 1.74; 95% confidence interval (CI) 1.39–2.18, p<.001), stage IV disease at diagnosis (ref: stage I, aRR: 2.08; CI 1.52–2.86, p<.001), and lung cancer (ref: breast cancer, aRR: 1.84; CI 1.30–2.61, p<.001; Figure 1). Other significant predictors include Hispanic ethnicity, less than a high school education, Medicare/Medicaid dual enrollment, initial treatment with surgery, unmarried status, and central or western region of the United States (aRR in Table S3). Significant predictors of severe functional limitation due to either pain or emotional distress modeled separately include age 80 years (y), lung cancer type, stage IV at diagnosis, initial therapy with surgery, pulmonary disease, stroke, less than a high school

education, and Medicare/Medicaid dual enrollment (Figures S1 &S2, aRR reported in Table S3). Self-reported depression (aRR: 4.1, 95% CI 3.5–4.8; Table S4) was significantly associated with severe functional limitation due to pain and emotional distress, while female sex, marital status, and Hispanic ethnicity was a significant predictor of severe functional limitation due to emotional distress (aRR: 1.4, 95% CI 1.1–1.8; Table S4). Model C-statistics suggested good predictive ability (0.76–0.79).

Prescription medication use

Pain: Overall, among 6,244 individuals reporting moderate to severe functional limitation due to pain, 38.1% received at least one prescription for pain medication. Among individuals reporting severe functional limitation, 55.2% received at least one prescription pain medication, compared to 29.7% of individuals with moderate functional limitation. The majority of individuals reporting severe functional limitation due to pain were prescribed an opioid or NSAID (Figure 2).

Emotional distress: In contrast, only 26.4% of the 4,396 individuals reporting moderate to severe functional limitation due to emotional distress, received any emotional distress prescription medication. The most commonly prescribed medication types for individuals reporting severe functional limitation were antidepressants (26.2%) followed by anxiolytics/sedatives (14.3%) and antipsychotics (3.7%) (Figure 3).

Co-occurring **symptoms:** Among the 893 participants who reported co-occurring severe pain and emotional distress, 13% received only emotional distress medication, 29.6% received only pain medication, 24.9 % received medication for both symptoms, and 32.5% received no medication for either symptom.

Discussion

Pain is a highly reported health problem for older adults and continues to increase in prevalence and severity as compared to younger adults.[12,33] Using a novel linkage of SEER-MHOS data to Part D Medicare prescription medication claims, the present study found that nearly 70% of Medicare beneficiaries with cancer aged 66–102 years reported moderate to severe functional limitation due to pain, while 50% reported moderate to severe functional limitations due to emotional distress. These findings are consistent with prior work linking pain with functional limitation and disability among older adults.[11,33,34] Importantly, this study focused on older adults with cancer and identified characteristics significantly associated with severe functional limitation due to pain or emotional distress, including age 80 years, stage IV disease at diagnosis, and lung cancer. Many patients, despite reporting severe functional limitation, did not receive any prescription medication for reported pain or emotional distress. This may be a result of lack of Medicare cover for benzodiazepines, a medication class often used for emotional distress, until 2013.

This study documents significant functional limitation among cancer patients aged 80 years and older, due to the symptoms of pain and emotional distress. Octogenarians are the fastest growing age demographic worldwide, but are underrepresented in cancer clinical trials and understudied in cancer outcomes research.[35] Notably, this disconnect creates a large

evidence gap in how best to diagnose and intervene upon functional limitations and related disabling symptoms such as pain and emotional distress. Monitoring functional status as a key patient-reported outcome could inform future interventions on how to prevent functional decline and improve resiliency, particularly among cancer patients aged 80 years and older. Given previous research highlighting that only one-third of patients with cancer would choose to undergo a treatment regimen if it resulted in functional limitation,[1] functional status is a particularly important outcome to consider when caring for these patients.

In addition to age, lung cancer and stage IV disease were also significant predictors of functional limitation, likely due to the presence of disabling symptoms. Lung cancer is commonly diagnosed at an advanced stage with metastasis to other organs or fluid accumulation in the lungs, causing symptoms such as pain or emotional distress due to shortness of breath.[36] The early integration of palliative care specifically in advanced lung cancer can result in improved quality-of-life, fewer depressive symptoms, and improved overall survival.[37] Given the overall large societal burden of lung cancer as the leading cause of cancer-related mortality in the United States,[38] additional research targeting functional status evaluation[39,40] and supportive care during treatment such as early palliative care integration, specifically designed for older adults with lung cancer, could improve symptom-related disability.

Only half of older adults reporting severe functional limitation due to pain in this study received a prescription pain medication and only one third reporting severe functional limitation due to emotional distress received a prescription medication to target these symptoms. The stigma associated with mental health issues and the mandatory reporting of pain as the "5th vital sign" may explain the differences in prescribing patterns found in this study.[41] In addition, depression was significantly associated with severe functional limitation due to pain, highlighting the need for intensified co-management of emotional distress with physical symptoms such as pain. Efforts to improve both evaluation i.e. geriatric assessement[39] and treatment of functional limitation due to disabling symptoms should be a priority for older adults with cancer.

Limitations

This study has limitations typically associated with use of survey and administrative claims . While the SEER-MHOS is population-based, it is limited to Medicare beneficiaries enrolled in Medicare Advantage plans. Their experience with symptom assessment and treatment may differ from that of beneficiaries enrolled in the traditional Medicare benefit. However, over 20% of the sample comprised octogenarians with a cancer diagnosis (over 2,000 participants), which is comparable to other large cancer cohort studies.[42] The study bases symptom report on the VR-12 which is incorporated into the MHOS. The VR-12 patient-reported outcome measures are generic, and may not distinguish aspects of symptom burden specific to cancer such as neuropathic pain from chemotherapy agents versus nociceptive pain. In addition, it doesn't capture side effects of symptom management medications such as falls with benzodiazepines or constipation with opioids. Further, they are a snapshot in time, and do not capture information on symptom burden that may have preceded the cancer diagnosis or treatment. Our analysis included self-report of chronic conditions that may have

been alternate contributors to pain or emotional distress. The study used Part D claims data to identify prescription medications used for management of pain and emotional distress. We acknowledge that some medications may be used for both pain and emotional distress i.e. duloxetine; our clinical team assigned drugs to the symptom category where the drug was most commonly prescribed. We note that Part D claims reflect prescriptions that are filled, but do not capture medications recommended but not prescribed, or prescribed but not filled. Further, claims do not indicate whether medications were ingested as prescribed. Part D claims do not capture medications filled over-the counter or excluded from coverage, as in the case of benzodiazepines during the observation period. We also note that our analysis only includes pharmacologic symptom management, and only for oral prescription medications . Model fit could be stronger, but since we were hypothesis testing, we did not want to include interactions or other modifications that may improve fit but obscure interpretation. Lastly, this study was only able to document cancer-directed treatment among four major cancer types (subset analysis). Regardless of the source or onset of symptoms, clinicians need to be cognizant of unmanaged symptoms, as they interfere with cancer treatment, functional status, and quality of life.

Conclusion

Despite an increased focus on symptom management in recent years, functional limitation due to pain and emotional distress remain major issues among older adults with cancer, particularly those individuals 80 years and older. Over one-third of older adults reporting severe functional limitation did not receive any prescription medications for pain or emotional distress. Efforts to identify and target unmet supportive care needs to maintain functional independence in this population are greatly needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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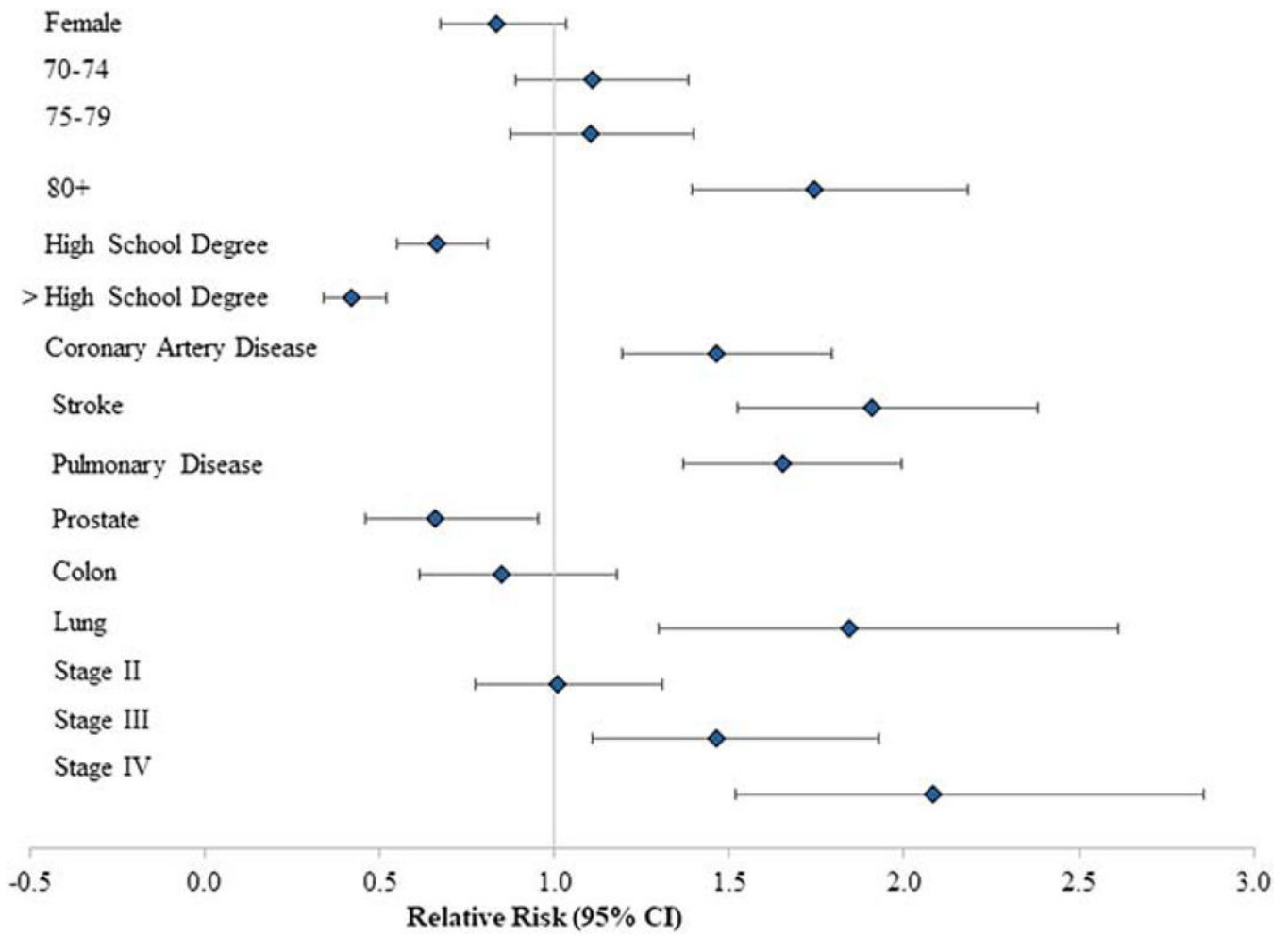
Figure 1.
Adjusted association of covariates with both pain and emotional distress: Severe pain and emotional distress vs. no severe pain and emotional distress (moderate + none). Models controlled for all variables described under Methods. Reference categories for reported characteristics were age 66–69 years, no High School diploma, breast cancer, Stage I disease at diagnosis.
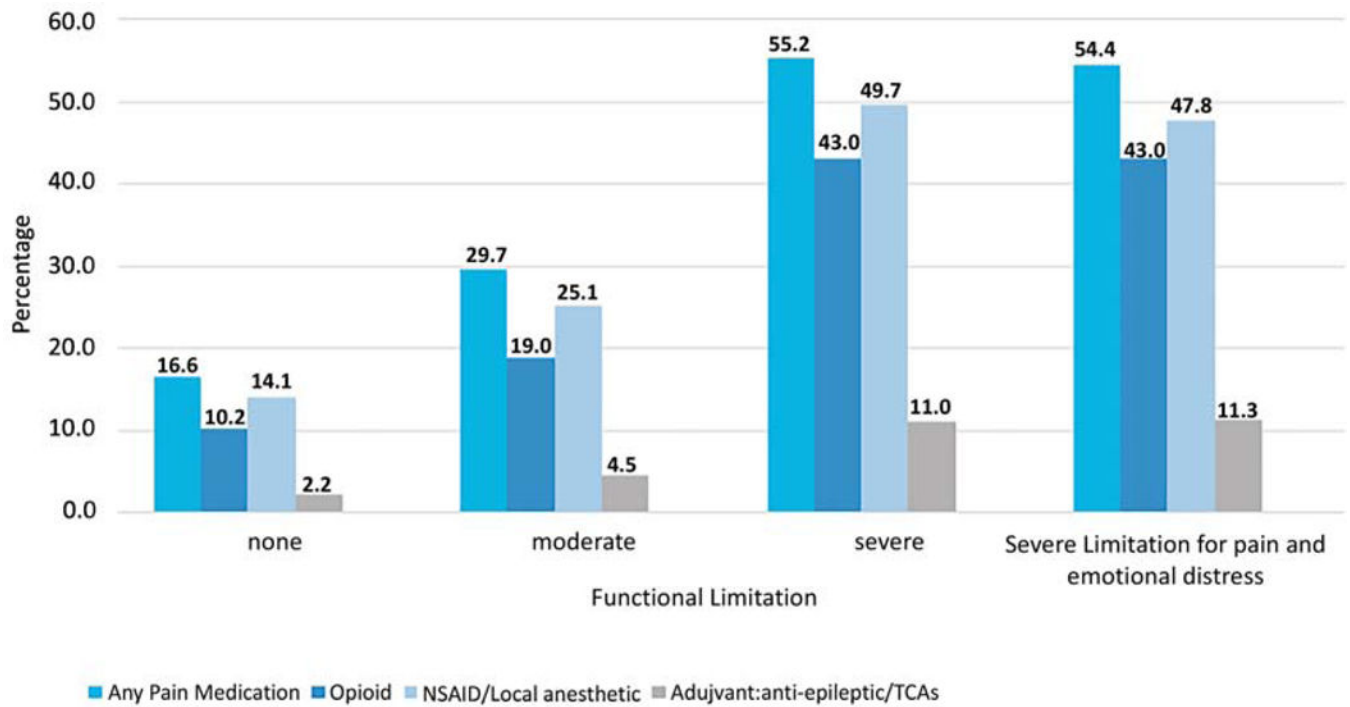
Figure 2:
Receipt of pain medication for self-reported functional limitation among SEER-MHOS respondents with cancer. All P-values are <0.01 across functional limitation categories for receipt of any pain medication and each type of pain medication. Note: Participants could be taking more than one medication class. Abbreviations: NSAID: non-steroidal anti-inflammatory drug; TCA: tricyclic antidepressant.
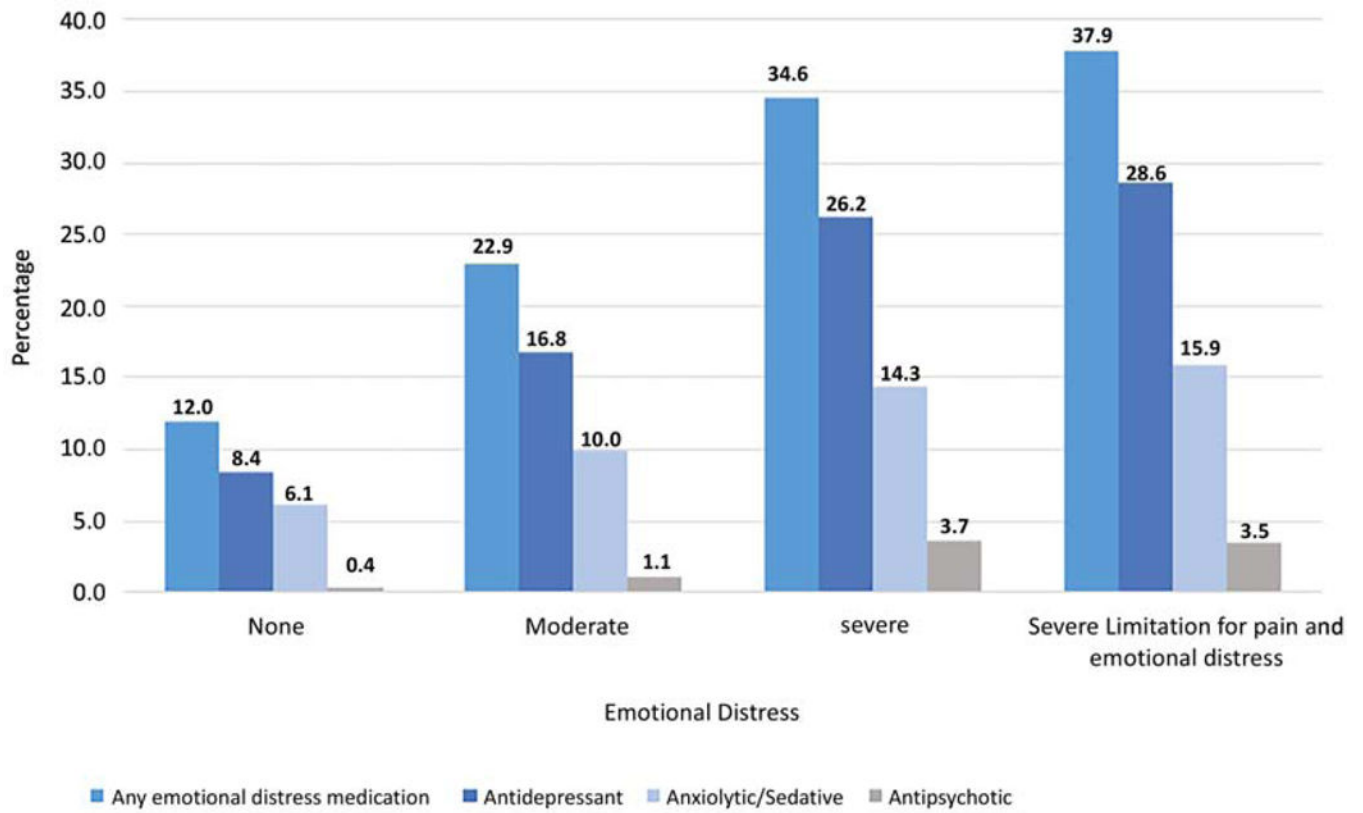
Figure 3:
Receipt of emotional distress medication for self-report functional limitation among SEER-MHOS respondents with cancer. All P-values are <0.01 across functional limitation categories for receipt of any emotional distress medication and each type of emotional distress medication. Note: Participants could be taking more than one medication class.

Table 1.

Sample Characteristics*

| Total (N=9105)	N	%
Age		
66–69 years (y)	2323	25.5
70–74 y	2556	28.1
75–79 y	2048	22.5
80+ y	2178	23.9
Sex		
Male	5059	55.6
Female	4046	44.4
Race/Ethnicity		
White, non-Hispanic	6142	67.5
Black, non-Hispanic	911	10.0
Hispanic	878	9.6
Asian, Other	1174	12.9
Marital Status		
Married	5321	58.4
Never/formerly married	3784	41.6
Education		
< High school degree	2266	24.9
High school degree	2791	30.7
> High school degree	4048	44.5
Comorbidity		
Coronary Artery Disease	1331	14.6
Stroke	827	9.1
Pulmonary Disease	1538	16.9
Diabetes	2428	26.7
Depression	1399	15.4
Cancer type		
Breast	1746	19.2
Prostate	2798	30.7
Colorectal	958	10.5
Lung	582	6.4
Other**	3021	33.2
Stage at diagnosis*		
I	2324	25.5
II	3387	37.2
III	888	9.8
IV	516	5.7
Unknown	1990	21.9

Total (N=9105)	N	%
Initial therapy		
Surgery	5693	62.5
Radiation	2923	32.1
MHOS survey year		
2008	1771	19.5
2009	2338	25.7
2010	1882	20.7
2011	1680	18.5
2012	1434	15.8
Diagnosis to survey (months)		
0–12	2205	24.2
13–24	1958	21.5
25–36	1666	18.3
37–48	1587	17.4
49–60	1689	18.55

*
Datasource: SEER-MHOS

**
Stage I included in situ carcinoma for breast cancer only

***
Other cancers included cancers of: oral cavity and pharynx, digestive system excluding colon and rectum, liver and intrahepatic bile duct, respiratory system excluding lung and bronchus, bones and joints, soft tissue, skin excluding basal and squamous, female genital system, male genital system excluding prostate, urinary system, eye and orbit, brain and nervous system, endocrine system, lymphoma, myeloma, leukemia and miscellaneous.

Table 2:

Unadjusted associations between type and degree of functional limitation and SEER-MHOS participant characteristics[a]

	Pain N=6244		Emotional Distress N=4396		Severe Pain and Emotional Distress
	Severe n=2054	Moderate n=4190	Severe n=1339	Moderate n=3057	n=893
	Row %	Row %	Row %	Row %	Row %
Total Sample					
N=9105	22.6	46.0	14.7	33.6	9.8
Age category					
66–69	**20.2**	44.8	**11.7**	**30.1**	**8.0**
70–74	**19.5**	47.1	**13.3**	**32.2**	**8.9**
75–79	**22.4**	46.3	**13.7**	**34.9**	**8.8**
80+	**28.9**	45.7	**20.4**	**37.7**	**13.7**
Sex					
Male	**19.9**	46.1	**13.9**	**31.8**	**9.1**
Female	**25.9**	46.0	**15.7**	**35.7**	**10.7**
Race/Ethnicity					
White, non-Hispanic	**20.6**	46.7	**12.4**	**32.1**	**8.3**
Black, non-Hispanic	**29.9**	41.6	**18.3**	**36.7**	**12.6**
Hispanic	**28.3**	45.0	**22.4**	**36.5**	**14.9**
Asian, non-Hispanic, Other	**22.7**	46.8	**18.1**	**36.8**	**11.8**
Marital Status					
Currently married	**19.5**	47.1	**12.3**	**31.7**	**8.3**
Never/formerly married	**26.9**	44.6	**18.1**	**36.2**	**12.0**
Education					
< High school degree	**33.3**	**43.7**	**25.1**	**35.8**	**17.4**
High school degree	**22.7**	**46.9**	**13.8**	**34.6**	**9.4**
> High school degree	**16.5**	**46.7**	**9.6**	**31.6**	**5.8**
Comorbidity					
Coronary Artery Disease	**35.5**	**45.8**	**23.4**	**36.9**	**18.1**
Stroke	**37.9**	**40.5**	**28.8**	**35.3**	**20.6**
Pulmonary Disease	**36.1**	**44.2**	**25.1**	**35.2**	**18.3**
Diabetes	**28.7**	**47.7**	**20.0**	**35.2**	**14.0**
Depression	**53.0**	**37.3**	**49.8**	**40.4**	**37.3**
Poverty rates					
Low (<5%)	**17.5**	**46.7**	**10.2**	**30.7**	**6.5**
5% to <10%	**19.7**	**47.6**	**11.9**	**33.7**	**8.0**
10% to <20%	**24.5**	**45.4**	**17.1**	**34.5**	**11.5**

	Pain N=6244		Emotional Distress N=4396		Severe Pain and Emotional Distress
	Severe n=2054	Moderate n=4190	Severe n=1339	Moderate n=3057	n=893
	Row %	Row %	Row %	Row %	Row %
High (20% +)	**30.3**	**43.9**	**20.9**	**35.8**	**14.3**
Cancer type					
Breast	**23.5**	47.4	**13.2**	**35.2**	**8.9**
Prostate	**17.2**	46.0	**10.9**	**29.8**	**7.0**
Colorectal	**19.9**	47.1	**14.9**	**36.6**	**9.6**
Lung	**37.1**	40.6	**27.2**	**34.2**	**20.8**
Other	**25.0**	46.0	**16.6**	**35.0**	**10.9**
Stage at diagnosis					
I	**22.0**	47.3	**14.1**	34.2	9.6
II	**19.3**	46.4	**11.6**	32.3	7.4
III	**24.3**	46.1	**18.5**	30.9	13.0
IV	**32.8**	39.2	**25.2**	35.3	18.2
Unknown	**25.4**	45.7	**16.3**	35.9	10.7
Initial therapy					
Surgery	**21.3**	47.1	**13.3**	**33.6**	9.0
Radiation	**20.7**	46.5	**13.1**	**33.3**	8.7
Current treatment [b]					
Breast Cancer	**25.8**	**48.6**	**14.8**	**37.2**	10.0
Prostate Cancer	**18.4**	**48.2**	**12.3**	**32.8**	7.8
Colorectal Cancer	22.1	49.0	**18.0**	**42.6**	12.1
Lung Cancer	**41.8**	**42.1**	**31.9**	34.6	**24.9**
Region					
Northeast	**20.2**	45.1	**11.8**	**36.1**	**8.0**
South	**19.1**	49.3	**10.7**	**31.8**	**5.9**
Central	**25.9**	44.8	**17.9**	**32.1**	**12.7**
West	**22.3**	46.2	**14.8**	**33.9**	**9.7**
Medicaid dual enrolled					
No	**20.1**	**46.3**	**12.6**	**32.4**	**8.3**
Yes	**36.5**	**44.6**	**26.5**	**39.9**	**18.1**
MHOS survey year					
2008	22.8	46.0	**14.9**	36.4	9.3
2009	21.7	45.6	**13.8**	32.8	9.0
2010	22.5	48.2	**15.4**	35.3	10.4
2011	22.8	45.2	**15.2**	31.0	10.9
2012	23.5	44.8	**14.5**	32.2	9.6
Diagnosis to survey (months)					

	Pain N=6244		Emotional Distress N=4396		Severe Pain and Emotional Distress
	Severe n=2054	Moderate n=4190	Severe n=1339	Moderate n=3057	n=893
	Row %	Row %	Row %	Row %	Row %
0–12	24.9	44.9	16.1 35.3	11.1	24.9
13–24	22.8	45.9	14.5 33.8	9.8	22.8
25–36	20.2	47.3	14.5 32.2	9.1	20.2
37–48	22.9	45.5	13.7 33.2	9.5	22.9
49–60	21.1	47.0	14.3 32.9	9.2	21.1

[a] bold values indicate bivariate analysis between each column and covariate X^2 p<.01 gray values indicate bivariate analysis between each column and covariate X^2 p<.05

[b] percentages were taken from total N for each cancer type. Treatment with surgery or radiation from SEER data