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Mental Health Treatment Dose and Annual Healthcare Costs in Patients with Cancer and Major Depressive Disorder

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Abstract

Objective: Depression in patients with cancer has been associated with increased annual healthcare use and costs relative to non-depressed patients. Little is known of the potential cost savings associated with receipt of mental health treatment. This study evaluated the association between number of mental health visits and annual healthcare costs in patients with cancer and comorbid major depression.

Methods: Using a retrospective cohort study design, this study included 182 individuals with an ICD-9 chart diagnosis of cancer in 2014 and with comorbid major depressive disorder. The outcome of interest was annual healthcare charges one year from cancer diagnosis. Number of mental health visits was extracted from patients' electronic medical records for the year following cancer diagnosis. A generalized linear model with a log link function and gamma distribution was used to evaluate the association between number of mental health visits and annual healthcare charges, covarying for age, sex, race/ethnicity, cancer site, metastatic disease, insurance status, and severity of comorbid medical conditions.

Results: A significant association was found between number of mental health visits and annual healthcare charges (exp(B) = 0.973, 95% CI = 0.949–0.999; p = .043). Estimated annual healthcare costs were $99,073 for those receiving no mental health visits and $71,245 for those receiving the sample-based mean of 12 mental health visits, inclusive of mental health visits.

Conclusions: Greater dose of mental health visits was associated with lower annual healthcare costs. Improved screening and adequate treatment of depression has potential to reduce total healthcare costs among patients with cancer. Because this was a small study, few patients with

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exceptionally high costs could augment the results. Therefore, replication of these findings, particularly using a clinical trial design, is needed to confirm these effects.

Keywords

Cancer; Depression; Psychotherapy; Psychiatry; Healthcare cost

Introduction

Depressive disorders in patients with cancer are 2–3 times more likely than in the general population (Caruso et al., 2017; Massie, 2004; Pirl, 2004), yet nearly 75% of cancer patients with major depression do not receive any potentially effective treatment for their depression (Walker et al., 2014). Among cancer patients with major depression, 22% receive antidepressant medications and only 5% receive psychosocial treatments from mental health professionals (Walker et al., 2014). A variety of impacts of depression on health outcomes in cancer patients has been reported, including increased mortality risk (Pinquart & Duberstein, 2010), elevated risk for medical non-adherence (Mausbach, Schwab, & Irwin, 2015), and increased healthcare service use (Mausbach & Irwin, 2017). Recent reports with cancer patients have shown that depression is associated with significantly greater annual healthcare costs (Mausbach, Yeung, Bos, & Irwin, in press). Other studies of non-cancer patients suggest that healthcare costs of recognized, unrecognized, and untreated depression exceed the healthcare costs of non-depressed and treated patients (Greenberg, Fournier, Sisitsky, Pike, & Kessler, 2015; Luppa, Heinrich, Angermeyer, Konig, & Riedel-Heller, 2008).table 2

Depression may contribute to increased healthcare utilization and costs via somatic experiences and depressogenic beliefs. Bodily distress is often an integral feature of depression, and heightened experience of depression can be associated with somatic preoccupation, expectations of suffering and discomfort, and beliefs they don't deserve to get better. These beliefs and perceptions can, in turn, serve as the rationale for scheduling visits with healthcare providers (Kroenke, 2003). Depression may also activate the cytokine cascade, with depressed patients showing significantly greater concentrations of TNF-alpha and Interleuking-6 than non-depressed individuals (Dowlati et al., 2010). This cascade may promote somatic symptoms (Bai, Chiou, Su, Li, & Chen, 2014) and risk for poor health outcomes (Heikkila et al., 2009; Kaptoge et al., 2014).

Psychosocial interventions have been found to significantly offset medical costs for people with general mental distress and with co-morbid medical illness, including cancer (Carlson & Bultz, 2004). In a meta-analysis of 91 medical cost offset studies, encompassing persons with general medical conditions, 90% reported some degree of cost reduction following psychosocial intervention (Chiles, Lambert, & Hatch, 1999). A review by Jansen et al. (2016) evaluated the relative efficacy and cost-effectiveness of psychosocial interventions in cancer patients compared to usual psychiatric care, finding that the majority of included study interventions were both more effective and more costly than usual care. However a gap remains in evaluating the effects of psychosocial interventions on total healthcare costs within cancer care. Only one study, by Simpson and Steven (2001) found that women with early-stage breast cancer who received a group psychosocial intervention incurred 24%

lower healthcare costs and reduced depression over a two-year period relative to women receiving a usual-care, self-help control intervention. Given that unrecognized and untreated depression may potentially result in shortened survival, reduced quality of life, reduced medical adherence, and increased medical service use, an evaluation of the impacts of mental health care on health-related outcomes is warranted. The current study sought to examine the potential economic impact of treated vs untreated major depression in cancer patients at a comprehensive cancer center. We hypothesized a significant negative association between mental health visits and total annual healthcare costs in the year following cancer diagnosis, whereby greater number of visits would be associated with lower total costs.

Methods

We conducted a retrospective electronic medical record (EMR) review of all patients within the University of California San Diego (UC San Diego) Health System with an ICD-9 chart diagnosis of cancer between January 1 and December 31, 2014. Patients were required to be at least 18 years of age or older, to have made at least one medical visit incurring a charge in the year following their diagnosis, and have a comorbid ICD9 diagnosis of Major Depressive Disorder (MDD) within one year of their cancer diagnosis. The outcome of interest was total annual healthcare charges in the year following their cancer diagnosis. The charges incurred for relevant services in the UC San Diego healthcare system were extracted from patients' EMRs and included charges for outpatient (ambulatory) office visits, emergency department visits, hospital visits, and mental health visits. Included among these charges were the costs associated with the visit and with labs and procedures. Charges from EMRs reflected actual monies received from payors, rather than charges billed. The primary predictor was total number of mental health visits during the same period, extracted from patients' EMRs and encompassing visits to UCSD Moores Cancer Center Psychiatry and Psychology providers. To allow for all participants to have a full year of healthcare charges, participants were excluded if they died during the year following their cancer diagnosis. Based on these criteria, the final cohort consisted of 182 patients.

Depression diagnosis was extracted from the patients' EMR. Patients with an ICD-9 diagnostic code of 296.2 or 296.3 were considered to have major depressive disorder. The Deyo-Charlson Comorbidity Index (DCCI)(Deyo, Cherkin, & Ciol, 1992) score was calculated to assess each patient's number and severity of comorbid illnesses. The DCCI considers several disease categories and assigns a weighted value to each based on risk of mortality within one year. More recent evidence indicates the DCCI is also a useful predictor for physician visits, hospitalization, health service cost, and mortality (Charlson, Szatrowski, Peterson, & Gold, 1994; Charlson, Wells, Ullman, King, & Shmukler, 2014; Charlson et al., 2008; Charlson, Pompei, Ales, & MacKenzie, 1987; Mausbach & Irwin, 2017). Thus, weighted scores represents disease severity, most notably in terms of risk for mortality (e.g., congestive heart failure = 2; moderate/severe liver disease = 4). If the individual does not have the disease, a score of '0' is assigned. The total score is the sum of the individual weighted scores, with higher scores indicating greater severity of comorbid diseases. Since, by definition, all patients in the current analysis had cancer, the redundant value of '2' was removed from each patient's overall score. In addition, the DCCI assigned a score of '6' to

individuals with metastatic disease. Since the impact of metastatic disease on healthcare costs was of particular interest in our analysis, we subtracted '6' from the DCCI scores of individuals who had metastatic disease and instead created a separate variable for metastasis (1 = yes; 0 = no) for inclusion as a covariate in our analysis. Annual mean costs of care differ by cancer site. Thus, we used the National Cancer Institute's annual cost estimates (calculated from SEER-Medicare linkage data) for each cancer site (Mariotto, Yabroff, Shao, Feuer, & Brown, 2011) to rank each participant's cancer using a 5-point scale, whereby cancers with the highest 20% of "cost to treat" received a score of '5' (e.g., neurologic and gastrointestinal), second highest 20% "cost-to-treat" receiving a score of '4' (e.g., respiratory), and so forth down to the lowest cost score of '1' (e.g., breast and skin).

Due to the skewed nature of cost data, our primary analysis used generalized linear models (GLM) with a log-link function and Gamma distribution. The GLM with log link approach is advantageous in cost analyses as it relaxes the normality and homoscedasticity assumptions of OLS regression and avoids issues retransforming costs to the raw scale. Total charges served as the dependent variable and number of mental health visits was the primary independent variable. Age, sex, race/ethnicity, cancer site, metastatic disease, insurance status, and DCCI score were included as covariates in the analysis. Secondary analyses evaluated charges associated with outpatient visits (inclusive of mental health visits), emergency department visits, and hospitalizations. All data were analyzed between July and April, 2018. The protocol was approved by the UC San Diego institutional review board.

Results

Characteristics of the sample are presented in Table 1. Participants ranged in age from 22–91 (median = 62.5) years, with 52.7% of the sample being female (n = 96). The mean length of time between cancer diagnosis and depression diagnosis was 69.9 days (95% CI = 51.8–88.0 days). To be thorough, we considered that greater length of time between cancer and depression diagnoses might be correlated with number of mental health visits for the year. However, the correlation between length of time between diagnoses and number of mental health visits was not significant ($r = -0.01$, $df = 180$; $p = .895$). Consistent with prior reports (Walker et al., 2014) the majority of patients (n = 126; 69.2%) did not receive any mental health visits in the year following their cancer diagnosis. Among those with at least one mental health visit the mean ± SD number of visits was 11.7 ± 10.3. Among those with at least one mental health visit, the mean ± SD annual mental health charges was US $2,211 ± $1,890.

Results of the GLM model showed a significant association between number of mental health visits and annual healthcare charges ($B = -0.03$, Wald $\chi^2 = 4.11$; $p = 0.043$), with each additional visit associated with a 2.7% reduction in total healthcare charges. Follow-up analyses explored the total costs for participants receiving no mental health visits vs those who received the mean of 12 visits. In these analyses, age was centered at 60 years, female sex and metastatic disease centered at +0.5 = "yes" and −0.5 = "no", respectively, DCCI centered at '2', and cancer cost rank centered at '3'. Insurance status was entered as two covariates: a) self-pay (yes = +0.67, no = −0.33) and b) medicare (yes = +0.67, no = −0.33), with private insurance representing the reference group. Race/ethnicity was entered as four

dummy variables as follows: a) Black (yes = +0.80, no = −0.20), b) Hispanic (yes = +0.80, no = −0.20), c) Asian/Pacific Islander (yes = +0.80, no = −0.20), and d) other race (yes = +0.80, no = −0.20). In this model, White race was used as the reference group. Results of these GLM analyses showed that patients with no mental health visits accrued an estimated mean charge of US $99,073 (95% CI = $56,872 - $172,586). By comparison, participants receiving 12 mental health visits had estimated mean annual healthcare charges of US $71,244 (95% CI = $38,586 - $131,545), a difference of $27,829 per patient in the first year after cancer diagnosis. A follow-up sensitivity analysis showed that persons with 4, 8, and 16 visits had estimated costs of $88,760 (95% CI = $50,949 - $154,635), $79,522 (95% CI = $44,740 - $141,345), and $63,829 (95% CI = $32,786 – $124,266), respectively, indicating a slight tapering of cost benefit as mental health visits increased.

Secondary analyses evaluated costs associated with outpatient visits, ED visits, and hospitalizations. No significant association was found between number of mental health visits and outpatient charges (B = 0.01, Wald χ^2 = 1.48; p = 0.224), ED charges (B = −0.02, Wald χ^2 = 2.93; p = 0.087), or hospital charges (B = −0.01, Wald χ^2 = 0.41; p = 0.523). While not significant, evaluation of these results suggested that cost savings were primarily from hospital and ED charges. Estimated hospital charges were US $120,043 (95% CI = $69,922 - $206,092) for patients with no mental health visits compared to US $104,949 (95% CI = $55,115 - $199,839) for patients with 12 mental health visits. Estimated ED charges were US $13,901 (95% CI = $6,953 - $27,791) for patients with no mental health visits compared to US $11,030 (95% CI = $5,247 - $23,189 for patients with 12 mental health visits.

Discussion

We found that greater number of mental health visits was associated with significantly lower annual healthcare charges in patients with cancer and co-morbid MDD. Specifically, for each additional mental health visit, the mean reduction in total charges was 2.7%. It is noteworthy that the total annual healthcare charges included the cost of mental health visits, amounting to a mean of $2,211 for patients receiving twelve mental health visits. Yet, the total estimated annual savings for patients receiving twelve mental health visits versus those receiving none was $27,829, which includes the cost of mental health visits. Population estimates indicate that approximately 1.3 million new cases of cancer occur every year (Jemal et al., 2017), with approximately 15% (200,000) suffering from major depression (Caruso et al., 2017; Massie, 2004; Pirl, 2004) and 70% (140,000) of these receiving no mental health treatment. If half of these individuals (70,000) received 12 mental health visits to manage their depression, our data suggests that the estimated savings could be as high as $1.9 billion for the US health system in one year. Previous studies of patients with a variety of health conditions have shown that receipt of psychotherapy is associated with a decrease in medical utilization and shortened hospital stays (MumFord, Schlesinger, Glass, Patrick, & Cuerdon, 1998). The current study extends these findings by providing a metric on the estimated healthcare cost savings per mental health visit. To our knowledge, these data have not previously been reported in this population.

The current study underscores the importance of early identification and intervention of depression in cancer patients. Consistent with previous reports (Walker et al., 2014), a high proportion of patients with major depression, over 69% in our sample, received no mental health visits in the year following their cancer diagnosis. Both pharmacologic and psychological treatments have been shown to be efficacious for depression in patients with cancer (Hart et al., 2012). Efficacy of these interventions appears not to be the key issue behind lack of mental health visits. Rather, other issues may be playing a role, such as adequate identification of depression by healthcare providers, access to care providers, insurance coverage and reimbursement, and willingness of patients to seek or receive mental health treatment, possibly due to the stigma associated with such care (Corrigan, 2004; Holland, Kelly, & Weinberger, 2010; Kadan-Lottick, Vanderwerker, Block, Zhang, & Prigerson, 2005; Saloner, 2017). One study of a comprehensive cancer center found that only 74.0% of patients were aware that psychotherapy services were available. Of this number, only 41.2% reported using these services (Richardson, Sanders, Palmer, Greisinger, & Singletary, 2000). This particular obstacle was not present in our analysis as all patients had a chart diagnosis of depression, however one could still be unsure of how many of these patients had lengthy discussions with their doctors or referral to mental health services. Another significant issue may be barriers imposed by insurance. Although the Affordable Care Act made an effort to decrease the rate of uninsured people with mental disorders, this reduction was minor (5.4%; Saloner, 2017) and many insurance plans still limit mental health services to those that are in a specific network or at a particular site (Page & Adler, 2008). These system level issues could also be interacting with individual level obstacles such as poor access to mental health (due to lack of transportation or urban vs. rural residence), or willingness of patients to seek or receive mental health treatment. A lack of engagement in mental health treatment could speculatively be due to increased hopelessness, which is associated with an increased desire for a quick death (Breitbart et al., 2000). It could also be due to the perceived stigma associated with mental health care (Corrigan, 2004; Holland, Kelly, & Weinberger, 2010; Kadan-Lottick, Vanderwerker, Block, Zhang, & Prigerson). Potential barriers to mental health treatment in cancer patients need to be addressed on both the system and the patient level. (Corrigan, 2004; Holland et al., 2010; Kadan-Lottick et al., 2005; Saloner, 2017). Finally, patients could have rigorous treatment schedules related to their cancer, particularly in the first year post diagnosis that could limit either their capacity or desire to attend mental health visits. This may be particularly true if they are trying to maintain employment while receiving cancer treatment. Because mental health visits are optional, they may be of lower priority for patients undergoing potentially rigorous cancer-related treatments.

Innovative strategies for increasing mental health service use are needed. Policies designed to address this issue are now being implemented nationwide. For example, the guidelines of several cancer accrediting bodies now require screening for psychosocial distress, including depression. These include the Cancer Program Standards of the Commission on Cancer (American College of Surgeons Commission on Cancer, 2016), the Clinical Practice Guidelines of the National Comprehensive Cancer Network (2018), and guidelines adopted by the American Society of Clinical Oncology (Andersen et al., 2014). Preliminary evidence suggests that such screening methods can successfully increase early referral to mental

health care (Braeken et al., 2013), possibly up to 10 times the rate compared to usual practice (Bauwens, Baillon, Distelmans, & Theuns, 2014). However, screening alone is not sufficient for improving referrals and ultimately well-being in cancer patients, and additional methods are needed including (but not limited to) organizational change (e.g., implementation of collaborative care models), improved coordination between departments (including mental health services), and clinician education (Gilbody, Whitty, Grimshaw, & Thomas, 2003; Hermanns et al., 2013; McCarter et al., 2018).

Limitations of the current study necessitate caution in interpreting the results. The sample was small, consisting of 182 patients. Due to the retrospective nature of our design we were required to rely on ICD-9 chart diagnosis of major depressive disorder, which raises concern for misclassification of diagnosis and the potential to introduce bias into results, as criteria used for diagnosing depression may be variable across providers (Fiest et al., 2014). Prospective studies, using standardized depression questionnaires to quantify the severity of depressive symptoms, would help clarify the role of depression on overall healthcare costs. There may be an autocorrelation between disease severity (i.e., cancer severity) and depression, with patients with more severe cancers more likely to become depressed. Thus, our study may have limited generalizability to the broader cancer population, particularly among those with less severe depression. Also, because we used ICD-9 diagnoses determined via administrative review, we were not able to determine if the diagnosis was active, or what portion of our sample had a history of MDD or if the diagnoses was new. Use of a modified DCCI score may have impacted results, as we removed values for metastasis from overall scores to evaluate specifically the impact of metastatic disease on overall costs. If metastasis was included in the overall DCCI score, contribution of the DCCI to overall costs would likely be greater. Another limitation is that our analyses utilized healthcare charges within the UC San Diego Health System. Charges for services are determined independently by each provider which may result in different effect sizes in different systems. Furthermore, it is possible that patients included in this study incurred healthcare charges outside the UC San Diego Health System that our methodology is unable to capture. Future research should make use of thorough interviews or validated depression screening questionnaires to more adequately capture major depression in the population of individuals included. Future studies will also need to more thoroughly address and control for severity of the cancer diagnosis, which may impact overall costs. This is a small study, where a few patients with exceptionally high costs could augment the results. Replication of results in larger samples is needed. Also, replication using a randomized clinical trial will be needed to confirm these findings and their overall effect sizes. Finally, future studies will need to control for cancer site, or conduct separate analyses by cancer site to determine if any differential relationship between mental health visits and costs exists between cancer sites.

Conclusions

We found that greater use of mental health services was found to be associated with significantly reduced overall annual healthcare charges among cancer patients with major depression. The overall savings associated with mental health care was approximately 2.7% per mental health visit. Efforts to reduce barriers to mental health care are greatly needed, including more systematic screening and identification of major depression among cancer

patients, referral to mental health care by other treatment providers, efforts to reduce stigma associated with receipt of mental health care, and improved reimbursement of mental health care by insurance providers. These efforts not only have the potential to impact quality of life metrics and cancer care outcomes in this population, but may also reduce burden to the health system by way of reduced overall costs of healthcare.

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Table 1.

Descriptive characteristics of the sample (N = 182)

Age, M (SD)	60.1 (13.1)
Female, n (%)	96 (52.7)
Race/Ethnicity, n (%)	
White	132 (72.5)
Black	8 (4.4)
Hispanic/Latino	21 (11.5)
Asian/Pacific Islander	13 (7.1)
Other	8 (4.4)
Cancer site, n (%)	
Genitourinary	40 (22.0)
Breast	39 (21.4)
Gastrointestinal	34 (18.7)
Hematologic	17 (9.4)
Respiratory	15 (8.2)
Lymphoma	9 (5.0)
Neurologic	9 (5.0)
Head and Neck	7 (3.8)
Musculoskeletal	5 (2.7)
Neuroendocrine	4 (2.2)
Other	3 (1.6)
DCCI, M (SD)	1.7 (2.2)
Metastatic disease, n (%)	59 (32.4)
Annual mental health visits, M (SD)	3.6 (7.9)

Note. DCCI = Deyo-Charlson Comorbidity Index.

Table 2.

GLM model predicting annual healthcare costs

Predictor	B (SE)	Wald	p-value	Exp(B)	95% CI
Age	−0.01 (0.01)	1.17	.279	0.99	0.97 – 1.01
Female	−0.38 (0.22)	3.13	.077	0.68	0.45 – 1.04
Black	0.06 (0.50)	0.01	.910	1.06	0.40 – 2.80
Hispanic	0.19 (0.32)	0.36	.549	1.21	0.64 – 2.29
Asian/Pacific Islander	−0.35 (0.42)	0.69	.407	0.71	0.31 – 1.61
Other Race/Ethnicity	−0.22 (0.51)	0.18	.674	0.81	0.30 – 2.20
Cancer cost rank	0.26 (0.08)	9.67	.002	1.29	1.10 – 1.52
Metastatic disease	0.45 (0.23)	3.72	.054	1.56	0.99 – 2.47
DCCI	0.06 (0.05)	1.74	.187	1.06	0.97 – 1.16
Self-Pay	−1.27 (0.81)	2.47	.116	0.28	0.06 – 1.37
Medicare	−0.31 (0.22)	1.94	.164	0.73	0.47 – 1.14
Mental Health Visits	−0.03 (0.01)	4.11	.043	0.97	0.95 – 1.00

Note. DCCI = Deyo-Charlson Comorbidity Index.