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Treatment for Depression and Health-Related Quality of Life among Adults with Arthritis

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Abstract

Depression treatment has been proven to relieve depressive symptoms and pain and may therefore improve the health-related quality of life (HRQoL) among adults with arthritis. The objective of the current study was to examine the HRQoL associated with depression treatment among adults with arthritis and depression. A retrospective longitudinal cohort study design using data from the Medical Expenditure Panel Survey (2009–2012) was adopted. The study sample consisted of adults (≥21 years) with co-existing arthritis and depression (N = 1692). Depression treatment was categorized into: antidepressants only, psychotherapy with or without antidepressants, and neither antidepressants nor psychotherapy. Multivariable Ordinary Least Square (OLS) regressions, which controlled for observed selection bias with inverse probability treatment weights (IPTW) were built to examine the association between depression treatment categories and the HRQoL scores. The OLS regression controlled for factors in the biological, psychological and social domains that may affect HRQoL. A majority of individuals reported taking antidepressants only (52%), 24.4% reported receiving psychotherapy with or without antidepressants and 23% did not receive either antidepressants or psychotherapy. In multivariable OLS regression with IPTWs, adults using only antidepressants had marginally higher physical component summary scores (beta = 0.96, p value = 0.096) compared to no depression treatment. There were no significant associations between depression categories and mental component summary scores. HRQoL was not affected by depression treatment in adults with coexisting arthritis and depression. Improvement in HRQoL may require a collaborative care approach and such intense care may not be replicated in real-world practice settings.

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Author Contributions Drishti Shah was responsible for developing the initial concept, study design and data analysis section of the study. Drishti Shah and Pragya Rai were responsible for result interpretation and writing the manuscript under Dr. Sambamoorthi's supervision. Dr. Sambamoorthi and Dr. Dwibedi mentored Drishti and Pragya and worked closely with them to develop the methodology, interpreting the study findings and drafting the manuscript. Dr. Dwibedi provided useful feedback on conceptualizing the study, identifying appropriate methodologies and also helped in editing the final manuscript.

Compliance with Ethical Standards

Conflict of Interest The opinions expressed in this article are of the authors and do not reflect the views/opinions of any organization. Ms. Drishti Shah declares that she has no conflict of interest. Ms. Pragya Rai declares that she has no conflict of interest. Dr. Nilanjana Dwibedi declares that she has no conflict of interest, and Dr. Usha Sambamoorthi declares that she has no conflict of interest.

Disclosures The authors have disclosed that they have no significant relationships with or financial interests in any commercial companies related to this study or article.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

Keywords

Arthritis; Depression; Depression treatment; Health-related quality of life; Antidepressants; Psychotherapy

Introduction

Individuals with arthritis and depression often experience greater functional impairment and worse health-related quality of life (HRQoL) compared to those with arthritis and no depression [1–5]. The most commonly used treatment options for depression include antidepressants, psychotherapy, and a combination of antidepressants with psychotherapy [6, 7]. Although psychotherapy alone can be effective in treating depression, studies have reported that the combination of psychotherapy with antidepressants is more effective in treating major depressive disorders as compared to either form of treatment alone [8, 9].

Treating depression in patient with arthritis has additional benefits. For example, depression in individuals with arthritis can exacerbate pain [10, 11]. Depression, when treated with antidepressants can alleviate pain in addition to reducing depressive symptoms in the general population [12, 13] as well as among adults with arthritis [14, 15]. Randomized clinical trials of antidepressants among RA patients have documented that individuals receiving antidepressant therapy had lower levels of pain compared to placebo [16–19]. Therefore, it is plausible that it may also improve an individual's health-related quality of life (HRQoL) as arthritis attributable pain has a negative impact on the HRQoL of an individual [20].

However, the effects of depression treatment on overall HRQoL among individuals with coexisting arthritis and depression have not been assessed by community and population-based studies. To our knowledge, only one randomized clinical trial, the IMPACT trial (Improving Mood Promoting Access to Collaborative Treatment) has evaluated the effects of depression treatment on the HRQoL in older adults suffering from arthritis in the US [15]. Results from this trial, which was performed at 18 primary care clinics reported that arthritis patients receiving a combination of antidepressants and psychotherapy showed reduction in depressive symptoms and pain and reported improved HRQoL compared to those who received usual depression care [15]. However, the improved outcomes were a result of a collaborative care approach and such intense care is generally not replicated in real-world practice settings.

Given the lack of population-based studies assessing the relation between depression treatment and HRQoL, it will be valuable to see if the findings of these randomized controlled trials are replicated in routine clinical practices. It is important to evaluate the impact of any medical treatment to control chronic medical conditions in terms of its ability to improve the patients' HRQoL [3] because HRQoL can assess overall well-being and numerically quantify the effect of disease morbidity on patients' daily living. In fact, HRQoL measures have now become an outcome of primary interest and have been widely accepted in both clinical trials and observational studies. Therefore, the primary aim of our study was to examine the association between type of depression treatment (antidepressants, psychotherapy, with or without antidepressants; and neither antidepressants nor

psychotherapy) and HRQoL among adults with coexisting arthritis and depression seeking care in real-world clinical practice settings. We hypothesize that combination therapy will be associated with better HRQoL in comparison to those who received no treatment among individuals with coexisting arthritis and depression.

Conceptual Framework

The Biopsychosocial framework was used to guide the selection of variables that can affect HRQOL among adult with arthritis and depression [21, 22]. This framework suggests that biological, psychological, and social domains can affect HRQoL. In our study biological domain was represented by age, sex, race, comorbidities, duration of arthritis diagnosis, type of arthritis (OA or RA), and baseline Physical Component Summary (PCS) scores. The psychological domain was represented by anxiety diagnosis and baseline Mental Component Summary (MCS) scores. The social domain was represented by education, employment status, income, marital status, health insurance, and prescription drug insurance coverage.

Methods

Study Design

We adopted a retrospective longitudinal study design with a one-year baseline and one-year follow-up period. Baseline period was used to measure the independent variables and follow-up year was used to measure the dependent variable – HRQoL.

Data Source

Data were obtained from the household component of the Medical Expenditure Panel Survey (MEPS) for years 2009–2012. MEPS is a national representative survey of the US civilian non-institutionalized population conducted by the US Agency for Healthcare Research and Quality (AHRQ). MEPS provides nationally representative estimates of health care use, expenditures, medical condition, respondents' health status, health-related quality of life, demographic and socio-economic characteristics, and satisfaction with health care [23]. Information about each household member is collected using computer-assisted personal interviewing (CAPI) technology. Respondents' reports were further verified by surveying their health-care providers as well as contacting the pharmacies where the patients reported filling the medications prescribed to them [23].

The survey utilizes an overlapping panel design, where a new sample panel is selected each year and then followed for two calendar years with five rounds of interviews [23], thereby enabling researchers to adopt a longitudinal study design. A longitudinal study design is preferred because it accounts for a temporal relationship between depression treatment and HRQOL as well as controls for baseline HRQoL scores. For the current study, the first year was used as the baseline period and the second year was used as the follow-up period.

Study Sample

The study sample comprised all adults, aged 21 years or older, alive during the observation period, and reported having depression and arthritis (either RA or OA) during the baseline

period. Individuals with arthritis were identified from respondents self-reports available either in the medical condition files or full-year consolidated files. Professional coders translated the verbatim text reported by the respondents to fully specified three-digit International Classification of Diseases, 9th edition, Clinical Modification (ICD-9-CM) codes. Individuals with depression were identified from the medical conditions files using the ICD-9-CM codes 296, 311 [24]. Individuals with arthritis were identified during the baseline year from both, queries related to whether or not the respondent has “RA, OA, or other forms of arthritis” and medical care encounters for arthritis recorded in the medical condition files. Individuals with RA were identified using the ICD-9-CM code “714”and individuals with OA were identified using the ICD-9-CM codes “715”. We combined data from 3 panels: 14 (2009–2010), 15 (2010–2011) and 16 (2011–2012) to obtain sufficient sample size.

Measures

Dependent Variable: HRQoL Measures during the Follow-Up Year—HRQoL of MEPS participants have been assessed by AHRQ using the Short Form Health Survey-12 version two (SF-12v2) [25]. The SF-12v2 measures 8 domains of health and is used to calculate two component scores, the Mental Component Summary Score (MCS) and the Physical Component Summary Score (PCS). The PCS and MCS scores range from 0 to 100 with higher scores representing better HRQOL and lower scores representing poor HRQoL [26]. For the present study, we used the MEPS calculated PCS and MCS scores to represent the physical and mental health components of HRQoL.

Key Independent Variable: Depression Treatment Categories—Type of depression treatment was used as the key independent variable and was measured during the baseline year. The depression treatment was grouped into three categories: 1) antidepressants only 2) psychotherapy with or without antidepressants, and 3) neither antidepressants nor psychotherapy. Antidepressant users were identified from prescribed medicines files using the Multum lexicon therapeutic classification scheme made available to the researchers using the database. The Multum therapeutic sub-classification 249 represented antidepressants. Psychotherapy use was identified from the outpatient and office-based medical provider visits. For each visit, the respondent was asked which category best described the care provided. One of the response categories was “psychotherapy or mental health counseling.” Individuals with at least one visit with psychotherapy or mental health counseling were considered to have received psychotherapy.

Other Independent Variables—These variables were measured during the baseline year. Information on other independent variables was obtained from the longitudinal files of the household component of MEPS database. The biological domain included age, sex, race/ethnicity, number of other chronic conditions, arthritis duration, and baseline PCS scores. The psychological domain included baseline MCS scores and anxiety diagnosis. We included anxiety as one of the independent variables, because anxiety has been found to be more common than depression in patients with arthritis and while physicians often screen for depression they often fail to consider anxiety [27]. The social domain included education

level, annual income, marital status, health insurance, and prescription drug insurance coverage.

Statistical Analysis

Chi-square tests were used to examine the significant unadjusted subgroup differences in depression treatment among individuals with coexisting arthritis and depression. The unadjusted difference between depression treatment categories and PCS and MCS scores were determined using F-tests. To account for systematic differences in observed characteristics and depression treatment categories, the Inverse Probability Treatment Weights (IPTW) were used. IPTWs were calculated as the inverse probabilities of individuals receiving the treatment categories based on their observed characteristics. Multinomial logistic regression on depression categories with age, sex, race/ethnicity, marital status, education, chronic conditions, medical, and prescription drug coverage as explanatory variables was used to derive IPTWs. Separate IPTW-adjusted multivariable Ordinary Least Square (OLS) regression models were used to examine the adjusted association between depression treatment categories and the HRQoL scores (PCS and MCS scores) after controlling for all the independent variables mentioned in the measures section. For the dependent variable, the “neither antidepressants nor psychotherapy”(no depression treatment) was used as a reference category. All statistical values were considered significant at a level of significance of $p \leq 0.05$. All statistical analyses accounted for the complex survey design of MEPS and were conducted using SAS software (version 9.4 SAS Institute Inc., Cary, NC, USA).

Results

We found that in a sample of adults ($N = 1692$) aged 21 years and above with coexisting arthritis and depression, majority were females (70.5%), whites (79.9%) with private health (57.4%) and prescription drug insurance (66.7%); and had education above high school (51%). Only 28.5% had incomes above the 200% federal poverty line. Among patients with arthritis and depression, 28.9% had comorbid anxiety. An overwhelming majority of our study sample had OA (87.8%); 44.2% reported having arthritis between 5 and 10 years (Data not presented in tabular form). In our study sample, more than half the individuals reported using only antidepressants (52.2%); 24.4% reported receiving psychotherapy (with or without antidepressants) and 23.3% reported receiving neither antidepressants nor psychotherapy. Chi-square testes revealed significant group differences by depression treatment (Table 1). With IPTW, the balance in covariates was achieved and there were no significant subgroup differences by depression treatment categories. The mean baseline PCS score was 41.94 (SE = 0.85) and MCS score was 39.72 (SE =0.73) (Table 2).

The follow-up year mean PCS and MCS scores and the standard errors with and without IPTW are presented in Table 2. The follow-up mean PCS and MCS scores among adults with arthritis and depression were lower than the mean PCS (Mean = 48.96; SE = 0.11) and MCS scores (Mean = 51.23; SE = 0.09) of all adults in the MEPS sample (data not presented in tabular form). There were no significant differences in mean PCS and MCS by depression treatment categories with IPTWs. However, without IPTW, the mean PCS scores were

significantly lower among those who used only antidepressants (38.13, SE = 0.54) when compared to the no treatment group (40.44, SE = 0.79, $p < 0.03$). Similarly, mean MCS scores were significantly lower among those who used psychotherapy with or without antidepressants (38.50, SE = 0.74) when compared to the no treatment group (40.79, SE = 0.78, $p < 0.04$).

The parameter estimates and standard errors of depression treatment categories from the OLS regressions on the follow-up PCS and MCS scores with and without IPTWs are summarized in Table 3. After adjusting for the biological, psychological and socio-economic factors, there was no association between depression treatment categories and PCS scores in models with and without IPTW. However, when baseline PCS scores were included in the model with IPTW, adults using only antidepressants had marginally higher PCS scores (beta = 0.96, p value = 0.096) compared to no depression treatment. Regarding MCS score, there were no significant associations between depression categories and MCS scores in all models with and without IPTWs.

Discussion

To date, this is the first population-based study, which used multiple years of nationally representative data and a robust study design to analyze the relationship between depression treatment and HRQoL among adults with arthritis and depression. We found that majority of the individuals with coexisting arthritis and depression used only antidepressants; one-quarter used psychotherapy (with or without antidepressants) and nearly one-fourth used neither antidepressants nor psychotherapy. The rate of depression treatment found in our sample was lower than those found among adults with only OA [28]. However, these results cannot be directly compared as our study also included individuals with RA. Consistent with published literature, in our study, several factors such as insurance type, prescription medication insurance, marital status, sex, age and race were found to be associated with use of depression treatment [28–30].

With regard to the association between depression treatment and HRQoL, we found significant associations between depression treatment categories and PCS and MCS in the bivariate analysis. However, when the systematic differences in characteristics by depression treatment categories were eliminated with IPTW, we did not find a significant bivariate association between depression categories and HRQoL measures. These findings suggest that analysis of the effect of depression treatment on HRQoL measures need to adjust for systematic differences in the probability of receiving antidepressants, psychotherapy, and neither antidepressants nor psychotherapy.

After controlling for baseline PCS and other independent variables, the association between antidepressants only and PCS reached marginal statistical significance ($p < 0.10$), with an increase in PCS scores by 0.96 points. However this association may not be clinically significant. This is noteworthy because, while some clinical trials reported better pain and functional outcomes as a result of depression treatment, these findings may not translate into improved PCS scores in real-world practice settings after controlling for the baseline scores. These findings are in line with the IMPACT trial study which found no significant

improvement in arthritis related pain and disability among individuals receiving systematic depression treatment with higher pain severity at baseline [30]. Furthermore, there is some evidence that older adults with depression and pain may not respond to depression treatment [30]. It has to be noted that bodily pain and physical functioning are used to calculate the PCS scores [26], therefore, we could not include pain as an independent variable in the model.

Overall, we were unable to directly compare our study findings with previous literature as previous studies have mainly focused on improvement in depression symptoms and arthritis –specific outcomes such as functional well-being, pain level and disability and did not focus on generic HRQoL measures. As noted in the introduction, the IMPACT trial assessed the HRQoL in addition to arthritis and depression-specific outcomes, and reported improved quality of life among older adults receiving collaborative depression care when compared to those receiving usual care [15]. However, such patient-centered care and constant monitoring of depression symptoms may not occur in real world practice settings. Furthermore, unlike the current study, the trial focused on only older adults and the overall quality of life measure used in this study was not as comprehensive as SF-12. It was assessed using a Likert scale from 0 to 10 [15]. Replication of our study findings may help guide clinicians on the effectiveness of depression treatment among adults with arthritis and depression in real-world practice.

As there is no consensus or clinical practice guidelines for treating individuals with arthritis and depression, the study findings raise several questions. For example, do individuals with arthritis and depression require more intensive and collaborative care, if so, how feasible is it in real-world practices? Will recent healthcare delivery reforms such as accountable care organizations, patient-centered medical homes that emphasize team-based collaborative depression treatment lead to improved HRQoL? Given that depression treatment may not be equally effective among all adults, do we need to consider heterogeneity of treatment effects and personalize types of depression treatment according to individual characteristics?

The current study has many advantages such as longitudinal study design, use of validated and widely-used HRQoL measures, inclusion of a comprehensive list of independent variables and controlling for baseline HRQoL scores while assessing the relationship between depression treatment and follow-up HRQoL scores among adults with arthritis and depression. Additionally, we adjusted for observed selection bias in depression treatment categories in the baseline year. Further, as stated in the introduction, clinical trials compared newer treatments or collaborative care with usual depression care [8, 9, 15, 17, 19, 31]. and “usual care”, does not include individuals who received neither antidepressants nor psychotherapy [12, 15]. Thus, inclusion of a no depression treatment group in the current study enabled us to evaluate the association between no depression treatment and the overall HRQoL measures. Most of these studies were restricted to adults with RA; the current study was inclusive of adults with RA or OA.

However, the limitations of the study need to be considered while interpreting the findings. Although we used the age of arthritis diagnosis as a proxy to control for the severity of arthritis, we were unable to control for the severity of depression and adherence to

depression treatment which can influence the health-related quality of life of these individuals. Secondly we did not measure the association of arthritis-specific treatment with HRQoL. Although we pooled data to get sufficient sample size, we did not differentiate between combined therapy and monotherapy with regard to psychotherapy as a very small number of individuals reported using psychotherapy alone. We did not distinguish between types of antidepressant medications and types of psychotherapy (for example, cognitive behavioral therapy, interpersonal therapy). Future research is needed to examine whether specific types of medications and therapies improve the HRQoL among adults with arthritis and depression. Lastly, social desirability bias and recall bias are other possible limitations, as the information in the database is self-reported by the respondents.

Conclusion

In summary, after adjusting for a comprehensive list of risk factors that may affect HRQoL and baseline HRQoL scores, we did not find any statistically significant associations between depression treatment and HRQoL measures among adults with coexisting arthritis and depression. To achieve improvements in HRQoL, depression may need to be treated within a collaborative care model with routine follow-up and such intense care is generally not replicated in real-world practice settings.

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Biographies

Drishti Shah is a graduate student in the Department of Pharmaceutical Systems and Policy at West Virginia University (WVU). She received her Master's in Health Outcomes from the University of Toledo and prior to that she completed her BPharm from Bombay College of Pharmacy, India. Drishti's research interests include mental health services research, comparative effectiveness and cost effectiveness research, pharmacoeconomic modelling, and secondary database analysis. She is actively involved in the International Society for Pharmacoeconomics and Outcomes Research WVU Student Chapter and is currently the President-elect for the same.

Pragya Rai got her Bachelor of Pharmacy degree from Delhi, India and Master's in Pharmacology from New York, US with an emphasis on free radicals and their effect on tumorigenesis through cell death mechanisms. She worked at Fox Chase Cancer Center on a DoE grant studying the effect of free radicals generated by low dose radiation on preventing neurodegenerative diseases. Following this, the experience in scientific writing provided her with a platform to write drug safety reports for FDA, EMEA, Health Canada, and other regulatory bodies for a global pharmaceutical company. She is currently pursuing a Doctor of Philosophy degree in Health Services and Outcomes Research program at West Virginia University, WV US.

Nilanjana Dwibedi is an Assistant Professor in the Department of Pharmaceutical Systems and Policy at West Virginia University School of Pharmacy in Morgantown, West Virginia. She joined the faculty of WVU in 2013. Dr. Dwibedi's research interests include assessment of patient- reported outcomes measures, medication error prevention, evaluating medication adherence, applying new methodology to conduct pharmacoepidemiology research and evaluating impact of new technology in US healthcare systems.

Dr. Sambamoorthi is a Professor in the Department of Pharmaceutical Systems and Policy. She received her master's and doctorate degree in economics from the University of Madras, India. Prior to joining the WVU School of Pharmacy, Dr. Sambamoorthi was the Professor and Director of Women's Health and Population-based Mental Health Disparities in the Department of Psychiatry at the University of Massachusetts Medical School, Worcester, Massachusetts. Her areas of research interest include health economics, global health,

women's health, healthcare in individuals with co-occurring physical and mental illnesses and healthcare disparities by gender, race/ethnicity, age, and disability.

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Table 1

Sample characteristics by depression treatment categories in adults with arthritis and depression. Medical Expenditure Panel Survey, 2009–2012

Variables	No Treatment		Only Antidepressants		Psychotherapy with or without Antidepressants		*P* value
	N	Wt.%	N	Wt.%	N	Wt.%	
ALL	395	23.3	884	52.2	413	24.4	
Biological-Biomedical factors							
Age							
22 to 49	178	45.6	237	24.8	190	46.1	<0.0001
50 to 64	137	33.5	378	43.8	180	42.4	
≥65	80	21.0	269	31.4	43	11.5	
Sex							
Women	260	62.6	663	73.2	300	71.3	0.003
Men	135	37.4	221	26.8	113	28.7	
Race							
White	230	73.9	636	84.8	240	73.8	<0.0001
African American	70	9.8	115	5.9	89	11.2	
Latino	80	12.6	90	5.0	61	10.0	
Other	15	3.7	43	4.4	23	5.0	
Number of comorbidities							
0 to 1	163	43.7	241	26.7	148	38.2	<0.0001
2 to 4	195	47.4	488	55.7	209	48.8	
5 or more	37	8.9	155	17.6	56	13.0	
Type of arthritis							
RA	42	10.3	134	12.4	69	13.5	0.425
OA	353	89.7	750	87.6	344	86.5	
Duration of arthritis							
< 2 years	46	16.3	90	12.8	44	12.1	0.230
2 years	56	18.2	143	19.7	77	25.4	
2 to <5 years	60	24.3	152	20.8	67	22.3	
5 to <10 years	112	41.3	323	46.7	118	40.3	
Psychological factors							

Variables	No Treatment		Only Antidepressants		Psychotherapy with or without Antidepressants		*P* value
	N	Wt.%	N	Wt.%	N	Wt.%	
Anxiety							
Yes	90	22.9	210	24.3	197	44.9	<0.0001
No	305	77.1	674	75.7	216	55.1	
Social-socioeconomic factors							
Education level							
Less than HS	110	23.9	189	16.1	92	15.4	0.002
HS	120	29.6	326	34.3	119	26.6	
> HS	161	46.5	366	49.6	201	58.0	
Income							
Poor/Near Poor	223	51.1	431	40.3	243	48.7	0.004
Middle Income	101	26.8	241	27.3	90	26.4	
High Income	71	22.1	212	32.4	80	25.0	
Marital status							
Married	152	40.7	425	54.2	132	36.5	<0.0001
Widow	44	11.3	122	12.8	29	6.6	
Separated/Divorced	111	27.2	244	23.5	155	35.1	
Never married	88	20.9	93	9.6	97	21.8	
Health insurance							
Private	171	50.5	463	61.1	178	55.0	<0.0001
Public	152	33.3	364	33.7	202	38.0	
Uninsured	72	16.3	57	5.2	33	6.9	
Prescription drug insurance							
Yes	201	56.1	567	70.1	256	68.4	<0.0001
No	194	43.9	317	29.9	157	31.6	

Key: Wt: Weighted; HS: High school; RA: Rheumatoid Arthritis; OA: Osteoarthritis

Based on 1692 adults aged over 21, reported having arthritis and depression in the baseline year and year and alive in the baseline and subsequent year and followed for one year. Values for the missing categories of duration of arthritis, pain, and education level variables are not presented. The p-values were derived from the chi-square tests between depression treatment categories and subgroup characteristics

Table 2

Weighted Means and Standard Errors of Health-Related Quality of Life Scores Physical Component Summary (PCS) and Mental Component Summary (MCS) During Baseline and Follow-up, By Depression Treatment Categories Adults with Arthritis and Depression, Medical Expenditure Panel Survey, Panels 2009–2012

HRQoL Measures	No Treatment		Only Antidepressants		Psychotherapy with or without Antidepressants	
	Wt. Mean	SE	Wt. Mean	SE	Wt. Mean	SE
Baseline PCS	41.94	0.85	38.12	0.52	39.75	0.88
Baseline MCS	39.72	0.73	42.26	0.57	37.67	0.69
Follow-up PCS	40.44	0.79	38.13	0.54	39.76	0.78
Follow-up MCS	40.79	0.78	42.71	0.58	38.50	0.74
Follow-up IPTW-adjusted PCS	39.10	0.88	39.02	0.57	39.65	0.78
Follow-up IPTW-adjusted MCS	41.06	0.89	42.03	0.60	40.05	0.83

Key: HRQoL: Health-Related Quality of Life; MCS: Mental Component Summary; PCS: Physical Component Summary; SE: Standard error; Wt.: Weighted; IPTW: the Inverse Probability Treatment Weights.

Follow-up PCS and MCS scores refer to scores not adjusted by IPTW.

Based on 1692 adults aged over 21, reported having diabetes and depression in the baseline year and year and alive in the baseline and subsequent year and followed for one year. Values for the missing categories of the body mass index and smoking status variables are not presented. The p-values were derived from the F-tests between depression treatment categories and the physical and mental health component summary scores

Table 3

Parameter Estimates and Standard Errors of Depression Treatment Categories from Ordinary Least Squares Regression on Physical Component Summary and Mental Component Summary of the Short Form Health Survey-12 version 2 during Follow-up, Medical Expenditure Panel Survey, Panels 2009–2012

	Physical Component Summary			**IPTW-Adjusted Physical Component Summary**		
	Beta	**SE**	***P*-value**	**Beta**	**SE**	***P*-value**
Depression Treatment categories						
Model 1: Unadjusted model						
Only antidepressants	−2.15	0.97	0.028 *	0.17	1.09	0.879
Psychotherapy with or without antidepressants	−0.63	1.15	0.583	0.71	1.21	0.554
No treatment	Reference group					
Model 2: Adjusted for biological-biomedical, psychological, and social-socioeconomic factors						
Only antidepressants	−1.09	0.79	0.170	0.02	0.81	0.980
Psychotherapy with or without antidepressants	−0.55	0.94	0.562	0.54	1.01	0.594
No treatment	Reference group					
Model 2: Adjusted for biological-biomedical, psychological, social-socioeconomic factors and baseline HRQoL measures						
Only antidepressants	0.86	0.55	0.122	0.96	0.58	0.096
Psychotherapy with or without antidepressants	0.85	0.64	0.188	1.11	0.72	0.128
No treatment	Reference group					
	Mental Component Summary			IPTW-Adjusted Mental Component Summary		
	Beta	SE	*P*-value	Beta	SE	*P*-value
Depression Treatment categories						
Model 1: Unadjusted model						
Only antidepressants	1.95	1.00	0.052	1.01	1.10	0.360
Psychotherapy with or without antidepressants	−2.21	1.05	0.0374 *	−0.93	1.16	0.426
No treatment	Reference group					
Model 2: Adjusted for biological-biomedical, psychological, and social-socioeconomic factors						
Only antidepressants	0.55	0.97	0.575	0.97	1.00	0.334
Psychotherapy with or without antidepressants	−1.68	1.04	0.110	−0.63	1.06	0.553
No treatment	Reference group					
Model 2: Adjusted for biological-biomedical, psychological, social-socioeconomic factors and baseline HRQoL measures						
Only antidepressants	0.21	0.78	0.783	0.21	0.82	0.798

	Physical Component Summary			IPTW-Adjusted Physical Component Summary		
	Beta	**SE**	***P*-value**	**Beta**	**SE**	***P*-value**
Psychotherapy with or without antidepressants	−0.70	0.84	0.407	−0.59	0.84	0.484
No treatment	Reference group					

Key: HRQoL: Health-Related Quality of Life; SE: Standard error; Beta: parameter estimate from the regression models

*** $p < .001$;

** $.001 < p < .01$;

* $.01 < p < .05$

Based on 1692 adults aged over 21, reported having diabetes and depression in the baseline year and year and alive in the baseline and subsequent year and followed for one year. Asterisks represent significant group differences compared to the reference group based on OLS regressions on the PCS and MCS scores.

Model 1: OLS regressions only controlled for depression treatment categories. Model 2: OLS regressions additionally controlled for biological-biomedical, psychological, and social-socioeconomic factors. Model 3: OLS regressions additionally controlled for the baseline PCS and MCS scores along with the above covariates