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Collaborative Depression Treatment in Older and Younger Adults with Physical Illness: Pooled Comparative Analysis of Three Randomized Clinical Trials

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Abstract

Objective—There have been few comparisons of the effectiveness of collaborative depression care between older versus younger adults with co-morbid illness, particularly among low-income populations.

Design—Intent-to-treat analyses are conducted on pooled data from three randomized controlled trials that tested collaborative care aimed at improving depression, quality of life and treatment receipt.

Settings—Trials were conducted in oncology and primary care safety net clinics and diverse home health care programs.

Participants—1,081 patients with major depressive symptoms and cancer, diabetes or other co-morbid illness.

Intervention—Similar intervention protocols included patient, provider, socio-cultural and organizational adaptations.

Measurements—The PHQ-9 depression, SF-12/20 quality-of-life, self-reported hospitalization, ER, ICU utilization, and antidepressant, psychotherapy treatment receipt are assessed at baseline, 6, 12 months.

Results—There are no significant differences in reducing depression symptoms (P ranged 0.18-0.58), improving quality-of-life (t=1.86, df=669, P=0.07 for physical functioning at 12 months; and P ranged 0.23-0.99 for all others) between patients ≥60 versus 18-59. Both age group intervention patients have significantly higher rates of a 50% PHQ-9 reduction (older: Wald χ^2[df=1]=4.82, p=0.03; younger: Wald χ^2[df=1]=6.47, p=0.02), greater reduction in major depression rates (older: Wald χ^2[df=1]=7.72, p=0.01; younger: Wald χ^2[df=1]=4.0, p=0.05) than enhanced-usual-care patients at 6 months, and are no significant age group differences in treatment type or intensity.

Conclusion—Collaborative depression care in individuals with co-morbid illness is as effective in reducing depression in older patients as younger patients, including among low-income, minority

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patients. Patient, provider, and organizational adaptations of depression care management models may contribute to positive outcomes.

Keywords

collaborative multidisciplinary care; depression; comorbid illness; diabetes; cancer; home health

OBJECTIVE

Despite evidence that depression is treatable, disparities in care remain among older adults, particularly within low-income and diverse cultural groups.(1-8) However, few studies have compared collaborative multidisciplinary depression treatment outcomes or treatment participation between older and younger patients with co-morbid physical illness, racial/ethnic diversity and across diverse care systems. A review (9) of 21 studies comparing cohorts of elderly and middle-aged depressed patients found that treatment differences (antidepressants (AM) or ECT) remission rates were not clinically significant between older and younger patients; however, older patients were more likely to have comorbid physical illness which is a risk factor for poor treatment response.(9,10) The review included two studies of combined AM and interpersonal psychotherapy.(11,12)

Collaborative depression care, including psychotherapy and/or AM using a stepped care algorithm, long term maintenance/relapse prevention follow-up, and consideration of patient treatment preferences is effective for older adults in primary care,(3,13-17) patients with co-morbid illness,(18,19) and racial/ethnic minority patients in safety net care systems.(20,21) In this report, we pooled intent-to-treat data of 1,081 patients with co-morbidity from three similarly designed randomized clinical trials of multidisciplinary collaborative care to examine: depression treatment effectiveness, functional outcomes and treatment participation between older (≥ 60) and younger (18-59) patients with major depression and co-morbid illness at 6 and 12 months post-baseline.

Depression care models were adapted for diverse safety net oncology and primary care clinics and home health care populations and care systems. Adaptations were designed to address patient, provider and organizational system needs (e.g., bilingual psychotherapists and patient navigators in the community safety net systems; nurses, social workers or psychologist in home care system providing Problem-Solving Therapy (PST), telephone symptom monitoring/ relapse prevention, and collaboration with physicians prescribing AM based on a stepped care algorithm.

METHODS

Study Sites, Sample Recruitment and Depression Screening

Trials were approved by the University of Southern California Health Sciences or University Park Institutional Review Board. The cancer (ADAPt-C) trial (21) (N=472; age 18 and older) and the diabetes (MDDP) trial (22) (N=387; 18 and older) recruited patients from oncology or primary care safety net clinics; the home care (HOPE-D) (23) trial recruited (N=311) patients ≥ 65 within a private Home Health Care agency, HMO or IPA program. Each trial used the Patient Health Questionnaire depression scale (PHQ-9) (24) for screening eligibility and outcome assessment. Criteria for major depressive disorder were based on a score of ≥ 2 for one of the two cardinal depression symptoms plus a PHQ-9 score of ≥10. The Cancer and Diabetes trials excluded patients with acute suicidality, a score of ≥8 on the AUDIT alcohol assessment, recent use of lithium or antipsychotic medication and in the cancer trial having advanced cancer that limited remaining life (25) expectancy to less than 6 months. Home care patients with significant cognitive impairment (Short Portable Mental Status Questionnaire

scores of <5) were excluded. Study participants were randomly assigned to intervention (INT) or enhanced usual care (EUC) by selecting a sealed envelope naming a study group generated via computer algorithm. Independent blinded outcome assessments were telephone administered by trained research interviewers at 6 or 8 (for the HOPE-D trial) and 12 months.

Enhanced Usual Care

EUC patients received standard health system care and were given patient/family focused educational pamphlets on depression (in Spanish if preferred); cancer and diabetes trial patients were also given a listing of community, financial, social services, transportation, and child care resources. Within each trial, the treating oncologist or primary care or home health referring physician was informed of patients' depression status and study participation. Treating physicians were free to prescribe EUC patients AM or to refer patients for mental health treatment, and patients were free to seek care in the community. Clinic oncologists or primary care physicians received two didactic sessions from the study psychiatrist in AM treatment and algorithm application; home health care referring physicians were provided a written description of the study and the algorithm. Outcome data were obtained via self-report.

Collaborative Depression Care Intervention

The collaborative care model in each trial provided a choice of first-line treatment: PST (16), antidepressant medication (AM), or combined treatment when clinically indicated (based on a stepped care algorithm); plus monthly telephone maintenance monitoring and relapse prevention follow-up over 12 months. (PST homework materials were linguistically and culturally adapted for the cancer and diabetes trials.) The Depression Clinical Specialist (DCS) (bilingual social workers in the diabetes and cancer safety net system trials) met weekly or biweekly via telephone or in-person for consultation with the study PI and study psychiatrist. In the HOPE-D trial, the DCS (a mental health nurse, social worker, or psychologist) met bi-monthly with a care system psychiatrist or in one system with a supervising mental health nurse. In the diabetes and HOPE-D trials, the primary care or referring physician prescribed AM; in the cancer trial, the study psychiatrist met with patients and prescribed AM. The initial DCS visit(s) included: a semi-structured psychiatric/psychosocial assessment; patient depression, PST and AM education; consideration of initial treatment choice; provision of respective care system and community resource navigation assistance; and included family members at patient request. Subsequent visits provided PST and/or AM monitoring and after completion of acute treatment, monthly follow-up maintenance telephone calls or home visits plus telephone calls. Didactic training was provided all DCS staff in PST, depression monitoring and AM use. In each trial, the DCS communicated with the primary care or referring physician or study psychiatrist in the oncology trial about patient's depression status, co-morbid illness medications, medical and psychosocial status, and assessed need to prescribe or adjust AM dosage, consideration of an anti-anxiety agent or sedative-hypnotic. (Table 1) INT data were tracked via written or secure website in all trials.

Each trial provided personalized collaborative care based on the structured algorithm for stepped care in the IMPACT primary care trial (15-17) to ensure patients received care consistent with their preference, clinical presentations and depression treatment responses over time. For example, for a patient who has not had full response to treatment by 4-8 weeks, Step 2 of the algorithm is employed. The patient on AM may require AM change or augmentation, including PST. The patient on PST alone is again educated about the option of AM and based on discussion between the study psychiatrist and the DCS, AM is prescribed by the respective physician. The patient who has not had a full response by weeks 8-12 proceeds to algorithm Step 3. During the routine DCS clinical consultation meeting (or telephone discussion with the home care referring physician), the psychiatrist recommended either another AM or dosage change, or a combination of PST and AM if not tried at Step 2, or referral for additional

treatment in a specialty mental health setting, which was facilitated by the DCS. Treatment at this step depended on clinical status, available community resources, and patients' willingness to accept recommended care. Patients with improved depression (PHQ-9 score less than 10) were provided with ongoing monthly telephone monitoring and relapse-prevention behavioral activation support.

Organizational System and Patient Population Adaptations

Home Health Care—Organizational leaders were engaged in the implementation and conduct of the study, including decisions about study design and intervention adaptations that were deemed to best fit the specific needs of each organization. Collectively, staff of the respective organizations included home health care nurses, psychiatric nurses, social workers, a case manager and a master's degreed psychologist. In each home care program, usual home care was initiated on receipt of treating physician referral for specified home care treatment. Routine depression screening via the PHQ-9 was mandated in each system to be carried out during the required home care admission visit or pre-admission telephone contact by a nurse.

Safety Net Care—In view of known barriers to participation in clinical trials and to depression treatment retention in low-income minority populations, efforts were made to facilitate recruitment and minimize attrition and acceptance of and adherence to PST or AM (26): 1) attention to cultural competence, eg., Spanish-speaking staff and intervention materials in Spanish adapted for literacy and idiomatic content, attention to family roles; 2) telephone outcome data collection; 3) optional evening/weekend telephone monitoring/relapse prevention and PST visits to coincide with oncology or diabetes appointments; and 4) patient navigation assistance with barriers to cancer, diabetes and depression treatment, including referral to community resources or services. Staff received self-administered training in cultural competency. Study participants were reimbursed for time in completing outcome interviews and in safety net clinics for transportation and co-pays for AM if indicated. PHQ-9 screening was conducted by a designated study recruiter in each clinic.

Data Collection

The PHQ-9 was used as both a screen and outcome measure because it provides a dichotomous diagnosis of major depression as well as a continuous severity score (27,28), measures a common concept of depression across racial and ethnic groups (29) and is believed to be practically feasible and sustainable in real world oncology, primary care and home health systems of care. In recent years, the PHQ-9 has emerged as a reliable depression screening tool with a demonstrated ability to identify clinically important depression, to make accurate diagnoses of major depression, to monitor severity of depression over time, and to monitor significant improvement in response to therapy.(30,31) The Short-Form Health Survey(32) (SF-12 or SF-20 in HOPE-D)was used to assess physical, role, social and emotional functioning, general health, and pain (score ranged 0 to 100, high score indicated better functioning or greater pain). PHQ-9 and quality-of-life assessments were conducted at baseline, 6 or 8 and 12 months. Patient self-reported hospitalization, ICU admission and ER use.

Analyses

Demographic and baseline clinical characteristics are examined between age groups - age≥60 versus 18-59. No further stratification on age is attempted to avoid the issue of low cell frequency that potentially yields unreliable analytical results. To evaluate intervention effects, intent-to-treat analyses are conducted at each follow-up, analyzed separately by age group. Logistic regression models for dichotomous variables and linear regression models for continuous variables are fitted with adjustment of baseline scores and respective trial. Outcomes compared between INT and EUC include treatment response (a 50% reduction of

PHQ-9 score from baseline that is considered a clinically meaningful improvement in depressive symptoms), major depression (PHQ-9 ≥10), composite scores of quality-of-life subscales, and health care utilization. All outcomes are also compared between age groups, controlling for intervention status as a covariate in the fitted model. In addition, among INT patients, treatment type and intensity are again compared between age groups. All analyses are conducted using SAS software, version 9.1.

Study retention rates among older patients are 65.5% at 6 months (cancer 53.8%, diabetes 78.6%, and HOPE-D 64.2%); with 57.7% at 12 months (41.8%, 71.8%, and 57.7%), respectively. Among younger patients, retention rates at 6 and 12 months are 74.3% (cancer 71.1%, diabetes 78.2%) and 65.1% (58.8% and 72.9%), respectively. The proportions of mortality and lost-to-follow-up are not significantly different between INT and EUC groups. Comparisons of baseline characteristics between patients who remained in the trial versus those lost find no significant differences in depression severity or functional measures. A relatively higher proportion of female and Hispanic patients remained in the trials (each χ^2 test with df=1: female - 6 months, 82.6% vs. 76.7%, χ^2=5.1, p=0.03; 12 months, 83.9% vs. 75.9%, χ^2=10.65, p=0.001; Hispanic - 6 months, 76.8% vs. 65.9%, χ^2=13.72, p=0.0002; 12 months, 77.9% vs. 66.6%, χ^2=16.91, p<0.0001).

A sensitivity analysis was conducted comparing study results using all-available raw data and data imputed with the “Hot Deck Imputation” approach implemented in SOLARS software, version 3.2 (33) Intervention effects on depression and functional outcomes analyzed with imputed data are consistent with results analyzed with all-available raw data except role and emotional functioning, and pain at 12 months in older patients; and emotional functioning at 12 months in younger patients. In this paper, we present results with all-available raw data.

RESULTS

Pooled Sample

Patients with major depressive disorder (1,081) were pooled from three randomized controlled trials (ADAPt-C = 448, MDDP = 387 and HOPE-D = 246) (Figure 1). Demographic characteristics, baseline depression, receipt of antidepressants, and co-morbid medical illness are presented in Table 2, stratified by age groups and trials. Patients are predominantly Latino women in the Cancer and Diabetes trials and European White women in HOPE-D. Compared to younger patients, older patients have higher proportions of males (24.8% vs. 15.3%), non-Latino (51.4% vs. 9.2%), unmarried (61.6% vs. 56%), moderate to severe depression (PHQ-9≥15, 52.7% vs. 38.8%), and history of depression (65.2% vs. 57.7%). Older subjects in the pooled sample also have higher proportions of arthritis (39.5% vs. 21.7%), heart disease (27.1% vs. 3.6%), and lower proportions of diabetes (45.8% vs. 53%), and cancer (26.4% vs. 57.6%) than their counterparts. More older than younger patients reported having previously received AM at baseline (18.6% vs. 10.1%, χ^2=16.03, df=1, p<0.0001). Ethnic minority patients are less likely to have previously received AM than European Whites (11.1% vs. 23.7%, χ^2=23.4, df=1, p<0.0001).

Depression Outcomes

Intervention effects on a 50% reduction of PHQ-9 scores, and persistent major depression (PHQ-9 score ≥10) at 6 and 12 months are presented in Table 3. There are no significant interactions between study arms or clinical trials with age groups on depression outcomes. Taking 50% PHQ-9 reduction from baseline to 6 months as an example, there is no significant interaction between study arm and age groups (Likelihood ratio test χ^2=0.05, df=1, p=0.82), or between clinical trials and age groups (Likelihood ratio test χ^2=0.30, df=1, p=0.58). Similar INT effects in older and younger age groups on 50% PHQ-9 reduction are observed over time.

INT patients in both age groups had significantly greater improvement in 6-month 50% PHQ-9 reduction and a greater reduction in major depression rates. Combining INT and EUC groups, there are no significant age group differences in 50% PHQ-9 reduction or major depression.

Functional Outcomes

There are no significant interactions between study arms or clinical trials with age groups on functional outcomes. Taking physical functioning at 6-month as an example, there is no significant interaction between study arms and age groups ($F[1,757]=1.32$, $p=0.25$) or between clinical trial and age groups ($F[1,757]=1.50$, $p=0.22$). At both follow-up times, INT patients have relatively better functional outcomes in both age groups, except physical functioning at both follow-ups in older adults and physical functioning at 6 months in younger patients. Significant (p values <0.05) intervention effects on social and emotional functioning at 6 months are consistent in older (mean±SD, social functioning: 54.29±38.51 in intervention vs. 28.98±37.69 in EUC; emotional: INT 62.20±24.20, EUC 55.71±23.69) and younger patients (social functioning: INT 71.56±31.37, EUC 65.94±33.32; emotional functioning: INT 59.72 ±24.23, EUC 55.13±24.36). In addition, older INT patients have significantly better role functioning at 6 and 12 months. Among younger adults, INT patients have significantly less pain at 6 and 12 months compared to EUC patients. Across INT and EUC groups, there is no significant difference at either 6- or 12-month follow-up in each functional outcome between younger and older adults (Table 4).

Health Care Utilization

There are no significant differences in patient reported hospitalization, ICU admission or, ER utilization in the past 6 months between intervention and EUC in either older or younger patients at either follow-up. Combining INT and EUC patients, the rates of hospitalization, ICU admission and ER use among older patients are 35%, 10%, 37% at 6 months; and 20%, 9% and 28% at 12 months, respectively; and in younger patients are 18%, 3% and 22% at 6 months and 15%, 3% and 22% at 12 months, respectively. Older patients have a higher adjusted rate of ICU admission than younger patients at 12-month follow-up (Wald $\chi^2=4.58$, $df=1$, $p=0.04$), however, otherwise there are no other significant age group differences in health care utilization at follow-up.

Treatment Receipt and Adherence

There is no significant interaction of age group with intervention status on receipt of depression treatment (Homogeneity $\chi^2=1.73$, $df=1$, $p=0.19$), indicating similar odds of receipt of depression treatment within older and younger age groups. Across age groups, INT patients are significantly more likely to use AM or psychotherapy than EUC patients (80.7% INT vs. 25.3% EUC; adjusted for trials, Wald $\chi^2=286.12$, $df=1$, $p<0.0001$). Of 94 older and 120 younger patients with persistent major depression (PHQ-9≥10) at 6 months, 39.4% older and 45% younger had PHQ-9 scores less than 10 at 12 months.

Intervention treatment participation (Table 5), 84% of older and 78% of younger patients were treated with PST and/or AM. Patient treatment refusal accounted for over 40% of untreated in both age groups; other reasons included, in older and younger groups respectively, death (15.2%, 16.7%), severe medical condition (6.1%, 1.4%), left care system (15.2%, 11.1%) and unable to locate (15.2%, 29.2%). The majority (85% older, 95% younger) of treated patients received PST (alone or in combination with AM); in both age groups, about 80% having at least 4 PST sessions. There were no significant differences in treatment type (Wald $\chi^2=0.79$, $df=1$, $p=0.38$), length of time on AM ($t=-0.58$, $df=398$, $p=0.56$), and number of PST sessions ($t=-1.44$, $df=267$, $p=0.16$) between older and younger groups with adjustment by trial. Treatment type or intensity did not vary in either age group between European White versus ethnic minorities.

CONCLUSION

In this pooled analysis, patient and care system specific collaborative multidisciplinary depression care is as effective in reducing depression in older as in younger adults with medical co-morbidity. Key study results include that this finding applied to patients with cancer, diabetes and other co-morbid illness as well as to low-income, minority patients being cared for in safety net care systems and for a significant number of patients, depression improvement continued for up to 12 months. Treatment participation was also similar between age groups, with an apparent preference for PST alone or in combination with antidepressants in both age and racial/ethnic sub-groups. Taken together, study results support the use of multidisciplinary collaborative care models that include treatment options, the application of a stepped care algorithm, maintenance and relapse-prevention telephone follow-up, and organizational and cultural adaptations in treating depression among patients with depression and co-morbid physical illnesses across the age spectrum.(7)

Patient, provider and organizational adaptations of multidisciplinary collaborative depression care in the study trials are likely to have contributed to depression symptom improvement as well as to depression treatment participation. Integrating mental health care within general health care that also improves communication across provider groups is increasingly recognized as an important pathway to improved patient care.(34) Perceived stigma may lead to reluctance to seek care in the mental health system, becoming a deterrent to receipt of care among older and minority populations.(35-37) Treatment preferences also affect treatment acceptance and adherence and older adults and minorities may prefer psycho-educational therapy formats.(16-17,38) Effective organizational strategies (39-40) generally include multifaceted quality improvement disease management, such as the implementation of routine depression screening, systematic application of evidence-based practice guidelines, clinical decision-making protocols and algorithms, follow-up through remission and maintenance, enhanced roles of nurses or social workers as depression care managers as well as integration of mental health specialists.

This pooled analysis highlights the effectiveness of diverse multidisciplinary collaborative care models that are responsive to diverse organizational provider resources, practices and preferences. Across the pooled trials, the DCS role and discipline varied as did the discipline and role of the psychiatric consult. In both the cancer and diabetes trials, the DCS staff were bilingual and skilled in providing patient navigation assistance (eg., patient support and assistance with managing communication across different care providers and care systems and access to community resources). In contrast, home health care nurses provided these services with limited assistance from home health care social workers. Again, underscoring responsiveness to provider and care system preferences and needs, in the cancer trial oncologists preferred that the consulting psychiatrist prescribe antidepressant medication, whereas in the safety net clinics, primary care physicians were comfortable prescribing these medications and rarely consulted the psychiatrist via pager.

Study limitations include the high attrition rates in all three trials, reflecting a physically ill older population, relatively high cancer deaths, and loss to follow-up among low-income Hispanic patients. Screening was done at admission to home care, however, repeat screening at different home health visits might improve the validity of the screening process as nearly a third of a subset of patients screening positive at admission experienced significant improvement at a subsequent screen. (Screening cancer patients was done ≥90 days following diagnosis to rule out adjustment disorder.) Finally, a significant number of patients refused to participate in the RCT, primarily explained by the illness and disability of the HOPE-D population precipitating caregivers to pressed concern that participation might overtax the patient or cultural concerns about depression and stigma.

Collaborative multidisciplinary depression care among older adults with co-morbid illness can be effective across care systems and diverse patients and organizations. Two study sites represented in this pooled analysis are continuing the care model post-trial, thus supporting the potential utility of translating and (patient and organizationally) adapting collaborative depression care for older adults to enhance sustainable depression care for patients with comorbid illness.

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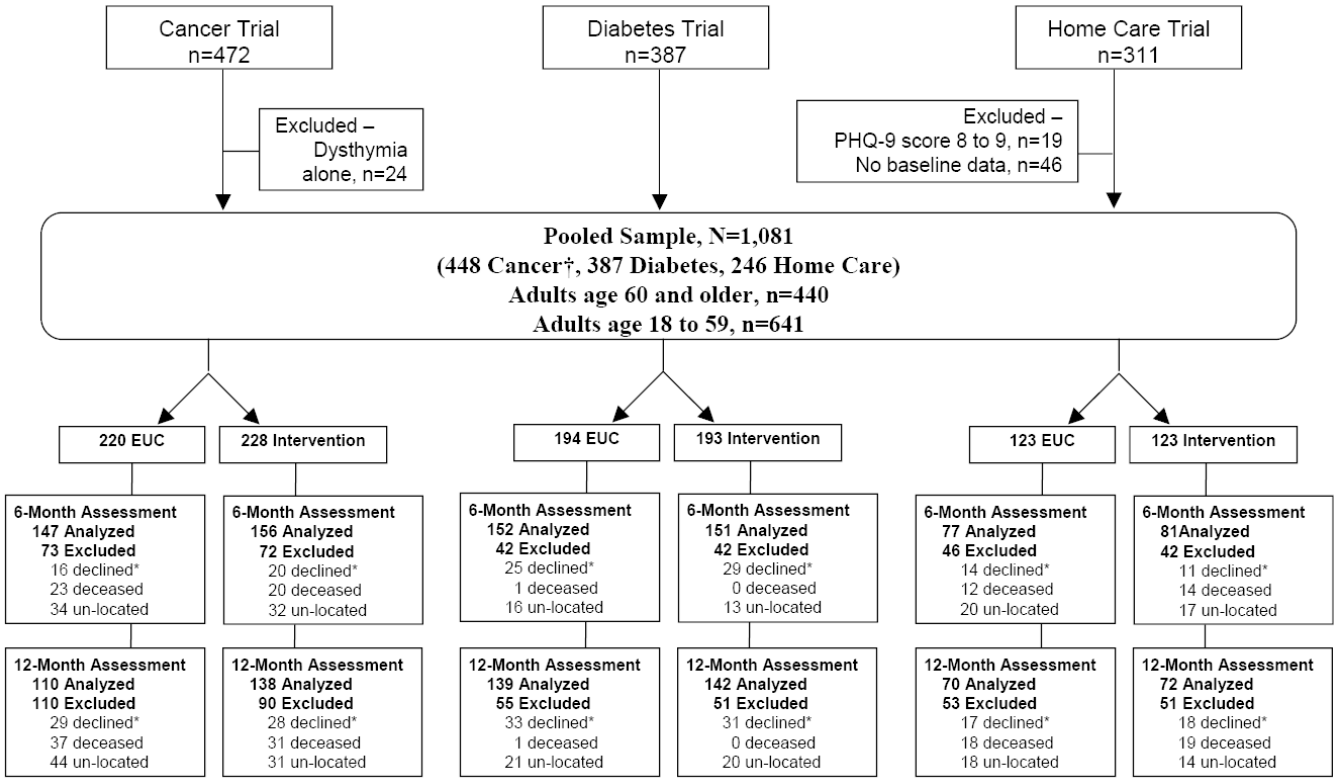

† 29% of patients were cancer stage 3, 4 or recurrent, 71% stage 0, 1, 2 or unstaged; Cancer sites - 43% female genital, 22% breast, 6% digestive system - colon/rectum, 6% other digestive system including liver, sigmoid, stomach, esophagus, gallbladder, anus and pancreas, and 23% other sites including lymphatic system, blood & bone marrow, lung, male genital, urinary, skin, oral cavity/pharynx, brain and thyroid.

* declined include patients who declined further study participation, were no longer living in US or receiving care at study site

Figure 1.
Pooled Data

Table 1

Collaborative Depression Care Management Intervention

Elements of the Collaborative Management	Cancer Trial	Diabetes Trial	Home Care Trial
Depression Treatment	PST and/or Antidepressant (AM) • Consider patient preference of first line treatment • Follow with stepped care treatment PST and or AM algorithm		
Provide PST by Depression Clinical Specialist (DCS)	Social worker, consultation with the study psychiatrist	Social worker, consultation with the study psychiatrist	Trained agency staff mental health nurse, social worker, or psychologist
Prescribe AM	Study psychiatrist	Clinic PCP applying study AM algorithm	Home health referring physician
Collaboration	The DCS communicates with AM prescriber about patient's depression status, co-morbid illness medications, medical and psychosocial status, and assessed need to prescribe or adjust AM dosage consideration of an anti-anxiety agent or sedative-hypnotic.		
PST Workplace	Clinic	Clinic	Residence
Maintenance Follow-Up	Telephone calls	Telephone calls	Tel/Home visits
Patient Navigator	Telephone/In-person	Telephone/In-person	DCS provider via /tel/home visit
Support Group	Open-ended optional PST support group	Open-ended optional PST support group	Not applicable

Table 2

Pooled Baseline Data*

	Adults age 60 and older				*Adults age 18-59*			
	Combined, N=440	**Cancer Trial, N=91**	**Diabetes Trial, N=103**	**Home Care Trial, N=246**	**Combined, N=641**	**Cancer Trial, N=357**	**Diabetes Trial, N=284**	**Age Group Difference**
Demographics								
Age, range	60 - 97	60 - 90	60 - 79	65 - 97	18 - 59	18 - 59	28 - 59	
Age, mean (SD)	71.6 (8.9)	65.4 (6.3)	64.0 (3.9)	77.1 (7.1)	46.9 (9.5)	44.2 (10.3)	50.3 (7.0)	t=43.27, df=1079, P<.0001
Female	331 (75.2)	67 (73.6)	87 (84.5)	177 (72.0)	543 (84.7)	312 (87.4)	231 (81.3)	x^2=15.16, df=1, P<.0001
Ethnicity/Race								
• Latino	214 (48.6)	79 (86.8)	100 (97.1)	35 (14.2)	582 (90.8)	312 (87.4)	270 (95.1)	x^2=265.88, df=4, P<.0001
• Black	26 (5.9)	4 (4.4)	1 (1.0)	21 (8.5)	18 (2.8)	16 (4.5)	2 (0.7)	
• European White	187 (42.5)	5 (5.5)	2 (1.9)	180 (73.2)	28 (4.4)	18 (5.0)	10 (3.5)	
• Asian	7 (1.6)	3 (3.3)	0	4 (1.6)	12 (1.9)	11 (3.1)	1 (0.4)	
• Other	6 (1.4)	0	0	6 (2.4)	1 (0.2)	0	1 (0.4)	
Marital Status								
• Married	169 (38.4)	33 (36.3)	44 (42.7)	92 (37.4)	282 (44.0)	135 (37.8)	147 (51.8)	x^2=210.81, df=3, P<.0001
• Divorced/Separated	66 (15.0)	18 (19.8)	21 (20.4)	27 (11.0)	168 (26.2)	94 (26.3)	74 (26.1)	
• Widowed	171 (38.9)	23 (25.3)	31 (30.1)	117 (47.6)	35 (5.5)	12 (3.4)	23 (8.1)	
• Single	34 (7.7)	17 (18.7)	7 (6.8)	10 (4.1)	156 (24.3)	116 (32.5)	40 (14.1)	
Depression Status								
Depression Severity								
• Mild Major 10-14	208 (47.3)	56 (61.5)	52 (50.5)	100 (40.7)	392 (61.2)	253 (70.9)	139 (48.9)	x^2=23.18, df=2, P<.0001
• Moderate 15-19	180 (40.9)	31 (34.1)	49 (47.6)	100 (40.7)	208 (32.4)	86 (24.1)	122 (43.0)	
• Severe 20-27	52 (11.8)	4 (4.4)	2 (1.9)	46 (18.7)	41 (6.4)	18 (5.0)	23 (8.1)	
History of Depression	287 (65.2)	46 (50.5)	62 (60.2)	179 (72.8)	370 (57.7)	198 (55.5)	172 (60.6)	x^2=6.16, df=1, P=0.02
Receipt of Antidepressants	82 (18.6)	5 (5.5)	19 (18.4)	58 (23.6)	65 (10.1)	24 (6.7)	41 (14.4)	x^2=16.03, df=1, P<.0001
Co-morbid Medical Illness								
Diabetes	196 (45.8)	30 (33.0)	103 (100.0)	63 (26.9)	340 (53.0)	56 (15.7)	284 (100.0)	All with df=1, x^2=5.39, P=0.03
Hypertension	195 (45.6)	41 (45.1)	81 (78.6)	73 (31.2)	270 (42.1)	80 (22.4)	190 (66.9)	x^2=1.24, P=0.27

	Adults age 60 and older				*Adults age 18-59*			
	Combined, N=440	**Cancer Trial, N=91**	**Diabetes Trial, N=103**	**Home Care Trial, N=246**	**Combined, N=641**	**Cancer Trial, N=357**	**Diabetes Trial, N=284**	**Age Group Difference**
Arthritis	169 (39.5)	30 (33.0)	57 (55.3)	82 (35.0)	139 (21.7)	56 (15.7)	83 (29.2)	x^2=39.65, P<.0001
Heart Disease	116 (27.1)	15 (16.5)	10 (9.7)	91 (38.9)	23 (3.6)	10 (2.8)	13 (4.6)	x^2=125.45, P<.0001
Cancer	113 (26.4)	91 (100.0)	4 (3.9)	18 (7.7)	369 (57.6)	357 (100.0)	12 (4.2)	x^2=100.67, P<.0001
Kidney Disease	39 (9.1)	13 (14.3)	17 (16.5)	9 (3.8)	50 (7.8)	28 (7.8)	22 (7.7)	x^2=0.58, P=0.45

* Data are presented as No. (%) unless otherwise indicated. SE indicates standard error.

Table 3

Depression Outcomes

	n (%)		Adjusted Analysis OR (95% CI)	Wald χ^2[df=1]	P
	Intervention	**EUC**	**Intervention versus EUC***		
Adults age 60 and older					
50% PHQ-9 reduction					
• 6-month follow-up	74 (52.5)	59 (40.1)	1.70 (1.06 - 2.74)	4.82	0.03
• 12-month follow-up	70 (56.0)	58 (45.0)	1.65 (0.99 - 2.73)	3.72	0.06
Major depression PHQ-9 ≥10					
• 6-month follow-up	50 (35.5)	73 (49.7)	0.49 (0.30 - 0.81)	7.72	0.01
• 12-month follow-up	41 (32.8)	53 (41.1)	0.61 (0.35 - 1.05)	3.13	0.08
Adults age 18-59					
50% PHQ-9 reduction					
• 6-month follow-up	137 (55.5)	100 (43.7)	1.61 (1.12 - 2.32)	6.47	0.02
• 12-month follow-up	136 (59.9)	90 (47.4)	1.65 (1.12 - 2.45)	6.28	0.02
Major depression PHQ-9 ≥10					
• 6-month follow-up	78 (31.6)	87 (38.0)	0.67 (0.45 - 0.99)	4.00	0.05
• 12-month follow-up	65 (28.6)	67 (35.3)	0.66 (0.43 - 1.01)	3.59	0.06
	Age 60+	**Age 18-59**	**Old versus Young****		
50% PHQ-9 reduction					
• 6-month follow-up	133 (46.2)	237 (49.8)	1.12 (0.75 - 1.67)	0.32	0.58
• 12-month follow-up	128 (50.4)	226 (54.2)	1.34 (0.87 - 2.06)	1.73	0.19
Major depression PHQ-9 ≥10					
• 6-month follow-up	123 (42.7)	165 (34.7)	0.82 (0.54 - 1.27)	0.78	0.38
• 12-month follow-up	94 (37.0)	132 (31.7)	0.72 (0.44 - 1.16)	1.84	0.18

*Logistic regression models are adjusted for baseline PHQ-9 score and type of trial.

**Logistic regression models are adjusted for baseline PHQ-9 score, type of trial, and intervention status.

EUC indicates enhanced usual care; OR, odds ratio; CI, confidence interval. Number of participants in adults age 60 and older: 6-month n=288, 12-month n=254. Number of participants in adults age 18-59: 6-month n=476, 12-month n=417.

Table 4

Comparisons of Quality of Life* Between Age groups

	Unadjusted Mean (SD)		Adjusted Analysis for Old versus Young			
	Age 60+	Age 18-59	Mean Difference (95% CI)	t	df	P
Physical Functioning						
Baseline	46.64 (44.51)	81.83 (33.56)	6.84 (2.00 - 11.68)	2.77	1079	0.01
6-month follow-up	41.38 (41.55)	65.02 (43.04)	2.34 (-5.21 - 9.89)	0.61	762	0.55
12-month follow-up	43.83 (41.56)	59.83 (44.52)	8.01 (-0.46 - 16.48)	1.86	669	0.07
Role Functioning						
Baseline	10.63 (26.83)	15.52 (29.73)	-2.03 (-6.63 - 2.57)	-0.86	1079	0.39
6-month follow-up	27.26 (36.91)	45.12 (39.68)	-0.07 (-7.08 - 6.95)	-0.02	762	0.99
12-month follow-up	28.75 (39.03)	51.20 (40.34)	-3.77 (-11.74 - 4.20)	-0.93	668	0.36
Bodily Pain						
Baseline	59.20 (36.94)	42.00 (31.89)	1.28 (-4.03 - 6.58)	0.47	1079	0.64
6-month follow-up	49.22 (36.41)	36.71 (31.96)	-0.18 (-6.22 - 5.87)	-0.06	762	0.96
12-month follow-up	53.35 (37.11)	36.39 (32.79)	2.28 (-4.44 - 9.00)	0.67	669	0.51
General Health						
Baseline	20.11 (19.16)	23.05 (18.49)	-0.40 (-3.37 - 2.58)	-0.26	1079	0.80
6-month follow-up	28.35 (23.79)	31.57 (20.72)	-1.09 (-5.13 - 2.95)	-0.53	762	0.60
12-month follow-up	30.39 (25.93)	34.83 (21.49)	-2.59 (-7.29 - 2.10)	-1.08	669	0.28
Social Functioning						
Baseline	38.69 (34.23)	46.52 (32.54)	1.73 (-3.44 - 6.90)	0.66	1078	0.52
6-month follow-up	51.57 (38.12)	68.86 (32.41)	-3.91 (-10.25 - 2.43)	-1.21	761	0.23
12-month follow-up	57.02 (38.09)	69.18 (32.49)	1.72 (-5.21 - 8.65)	0.49	668	0.63
Mental Health						
Baseline	43.29 (23.20)	35.66 (20.01)	0.54 (-2.85 - 3.93)	0.31	1079	0.76
6-month follow-up	58.89 (24.12)	57.52 (24.38)	-0.19 (-4.81 - 4.43)	-0.08	761	0.94
12-month follow-up	61.21 (24.83)	59.16 (25.00)	2.52 (-2.58 - 7.61)	0.97	668	0.34

* Short-Form Health Survey (SF) was used to assess quality of life scales (range 0 to 100, high score indicated better functioning and more pain). Home Care trial used SF 20 items survey (SF-20) and others used SF 12 items survey (SF-12). ANCOVA models were adjusted for baseline scores, type of trials and intervention status. EUC indicates enhanced usual care; SD, standard deviation; CI, confidence interval. Number of participants varied across waves and outcomes (old adults - baseline n=440, 6-month n=287-288, 12-month n=253-254; young adults - baseline n=640-641, 6-month n=475-476, 12-month n=417).

Table 5

Depression Treatment over 12 Months among Intervention Patients

	Unadjusted Mean (SD) or No. (%)			Adjusted Analysis for Old versus Young*
	ALL	Age 60+	Age 18-59	Statistic
Depression Treatment				Wald χ^2=0.79, df=1, P=0.38
• PST and AM	230 (42.3%)	97 (45.8%)	133 (40.1%)	
• Only PST	170 (31.3%)	56 (26.4%)	114 (34.3%)	
• Only AM	39 (7.2%)	26 (12.3%)	13 (3.9%)	
• none	105 (19.3%)	33 (15.6%)	72 (21.7%)	
Number of months on AM, Mean (SD)	7.14 (4.33)	6.28 (4.5)	7.86 (4.06)	t=-1.44, df=267, P=0.16
Of PST patients, PST sessions				Wald χ^2=0.07, df=1, P=0.80
• 1-3 sessions	82 (20.5%)	32 (20.9%)	50 (20.2%)	
• 4 or more sessions	318 (79.5%)	121 (79.1%)	197 (79.8%)	
Number of PST sessions, Mean (SD)	8.26 (6.19)	6.95 (4.59)	9.07 (6.89)	t=-0.58, df=398, P=0.56

*Regression model or logistic regression model adjusted for type of trial. PST indicates problem solving therapy; AM, antidepressant medication; SD, standard deviation.