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Predictors of New Onset Depression in Medically Ill, Disabled Older Adults at One Year Follow up

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Abstract

Objective—While medical illness and physical disability are strongly associated with depression, the majority of older adults who experience medical illness or disability at any given time are not depressed. The aim of these analyses was to identify risk factors for new onset depression in a sample of medically ill, disabled older adults.

Methods—We used data from a representative sample of homebound older adults who recently started receiving Medicare home healthcare services for medical or surgical problems (N=539). We report on the rate and baseline predictors of new onset major or minor depression, using DSM-IV criteria and assessed by the SCID, at one-year follow. Our analyses were conducted with a subsample of older adults (N=268) who did not meet criteria for major or minor depression, and were not on an antidepressant medication at our baseline interview.

Results—At one year follow-up, 10% (28/268) of patients met criteria for either major (3%; 9/268) or minor depression (7%; 19/268). In multivariate analyses, we found that worse self-rated health (OR=.53, p=.042), more somatic depressive symptoms (OR=1.19, p=.015), greater number of ADL limitations at baseline (OR=1.63, p=.014) and greater decline in ADL functioning from baseline to one year (OR=1.59, p=.022) were all independently associated with onset depression.

Conclusion—These findings underscore the significant fluctuations in both depression and disability in high-risk older adults and suggest that both persistent and new onset disability increase the risk of depression. They may also help in designing preventive strategies to promote the ongoing good mental health of these high-risk patients over time.

Keywords

depression; older adults; disability

Introduction

While medical illness and physical disability are strongly associated with depression, (1-5) the majority of older adults who experience medical illness or disability at any given time are not depressed. These individuals remain at increased risk of developing depression because functional disability and medical comorbidity are known risk factors for both new onset and

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persistent depression (1-5). Although there have been studies conducted on change in depression and disability status among community dwelling older adults, few studies have examined new onset depression among older, medically compromised adults using longitudinal, clinically informed diagnostic data.

In prior research, we found that approximately 25% (13% major, 12% minor) of older home care patients were diagnosed with depression (1), rates nearly twice as high as in primary care. Conversely, these rates demonstrate that approximately 75% of patients who are homebound as a result of medical conditions and disability are not depressed. Understanding what factors increase the likelihood of new onset depression in this high-risk group may help identify targets for early interventions and/or prevention.

In this paper, we use longitudinal data from a representative sample of older adults who recently started home healthcare services, a group characterized by substantial medical comorbidity and functional disability. Our primary aim was to identify baseline clinical and functional factors associated with the risk of depression at one-year follow-up. As the future trajectory of the health and functioning of these patients varies, we also explored differences in the association of persistent and deteriorating health and functioning with depression onset.

Methods

Data for the current study were collected as part of a longitudinal study on the prevalence, course, and outcomes of major depression in elderly patients receiving home-care skilled nursing services. The Institutional Review Board of Weill Cornell Medical College approved study procedures. The study was conducted with new patients of home health nursing services from a Medicare certified home healthcare agency (Visiting Nurse Services in Westchester, VNSW) in Westchester County, New York. Westchester County, NY, is a 420-square-mile, socioeconomically and ethnically diverse region, consisting of urban, suburban, and semi-rural areas. VNSW is a traditional, not-for-profit agency.

Sample

The study sample was designed to recruit a representative sample of agency patients admitted during a 2-year period between December 1997 and December 1999 who met the following criteria: 1) age 65 years old and older, 2) new admission, 3) able to given informed consent, and 4) able to speak English. From the 3,416 potentially eligible patients, the study selected 40% at random (N=1,359); 470 patients (35%) were deemed ineligible primarily because of homecare termination. 539 patients provided written consent and were interviewed in their homes by research assistants at baseline and at one-year follow-up interview (see (1) for full details of sampling).

The purpose of the current study was to identify new onset depression at one-year follow-up among patients without depression at baseline. For this end, we included 268 patients interviewed at one year who at baseline did not meet criteria for DSM-IV major or minor depression, and who were not on antidepressant medication. We achieved this sample by excluding 198 depressed patients and an additional 29 non-depressed patients who were taking an antidepressant at baseline. Of the remaining 312 patients, 44 were not available for one-year follow-up due to death, refusal for follow up, or unable to be contacted or to complete the assessment based on either physical or cognitive deficits. Surviving patients who did not complete the follow-up interview did not differ from the sample used in these analyses in terms of age, gender or race, but they did have significantly greater medical comorbidity on the Charlson Comorbidity Index (6) (range 0-6, 3.13 versus 2.24; t test=−3.39, df=310, p=.000).

Measures

To assess current and past history of depression, the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID) (7) was administered to both patients and informants by research associates trained in its use. Interrater reliability in the assessment of SCID symptoms was evaluated by having a second research associate observe and independently rate symptoms during in-person interviews with 42 patients. Reliability was excellent for assessment of number of symptoms present (intraclass r=0.91, 95% confidence interval [CI]=0.86–0.95). Interviewer ratings were monitored throughout the study by the study psychologist (PJR).

A DSM-IV diagnosis of current major or minor depression was determined by using consensus best-estimate conferences (8,9) that included the study's geriatric psychiatrist (BSM), geriatrician, clinical psychologist (PJR), and principal investigator (MLB). The conference reviewed information from the patient SCID, informant SCID, and medical record data on medications and medical status. Diagnoses of depression followed DSM-IV's "etiologic" approach, which excludes from diagnostic criteria symptoms judged solely attributable to general medical conditions or medications, a distinction that clinicians are able to judge reliably. Minor depression was defined using DSM-IV research criteria as having two to four SCID symptoms, at least one of which was depressed mood or anhedonia.

The test-retest reliability of the consensus best-estimate process was evaluated approximately 6 months after the final patient follow-up interview. Thirty previously reviewed patients were randomly selected, stratified by depression severity, and reevaluated by the panel. Reliability for the three-level outcome of major, subthreshold, or no depression was excellent (weighted kappa=0.89, 95% CI=0.77–1.00).

The 17-item Hamilton Depression Rating Scale (HDRS) (10) was used to assess baseline depression severity, which in these analyses was an indicator of subthreshold symptoms. Because of the high level of medical morbidity in this sample, we not only examined the total HDRS score, but used the strategy of McIntyre et al. (11) to create the eight-item HDRS somatic subscale (i.e. somatic symptoms, loss of weight, insomnia early, insomnia middle, insomnia late, somatic symptoms general, anxiety somatic and hypochondriasis) and the non-somatic subscale (i.e., emotional) consisting of the remaining 9 items.

Cognitive impairment was assessed using the Mini-Mental State Examination (MMSE) (12). Medical morbidity was determined from the medical record and patient interview by a geriatric internist using the Charlson Comorbidity Index (13), excluding scores for psychiatric illness. This index takes into account both the number of illnesses and their severity by assigning different weights to each major category of disorder. The Charlson Comorbidity Index as a classification of disease states has been shown to predict mortality, medical service use, and the emergence of new major medical illnesses (13).

Disabilities in activities of daily living (ADLs), instrumental activities of daily living (IADLs), and mobility were measured by counts of activities that the patient was unable to do without assistance (14-17). Pain intensity was assessed by the single three-level item from the Medical Outcomes Study 36-item Short-Form Health Survey (SF-36) (18). The four-items of the SF-36 physical health domain were used to quantify global assessment of health status. Poverty status was estimated by using an algorithm that compared self-reported household income and family size with 1998 U.S. Department of Health and Human Services poverty guidelines (19,20). Social support was measured with the subjective, social interaction frequency and instrumental subscales of the Duke Social Support Index (DSSI). Measures administered at one year included the SCID-IV, the Charlson Comorbidity Index, mobility, and ADL and IADL limitations.

Data Analysis

There were three goals of the current study: First, to report on the rate of depression onset at one year; second, to identify baseline variables which were predictive of depression onset at one year; and lastly to examine change from baseline to 1 year in medical comorbidity, mobility, and ADL and IADL functioning associated with depression onset.

Prior to the multivariate analysis, bivariate comparisons were conducted to identify associations between hypothesized baseline variables and depression at one year. We then added variables with nominal 2-sided *P* values of .10 or less from the bivariate analyses into a hierarchical logistic regression. Data analyses were conducted to construct a parsimonious and clinically informative model describing the likelihood of depression one year following homecare admission based on select demographic, clinical, and psychosocial variables. Only variables with a p value of less than .05 were retained in the final model.

Lastly, we explored whether change in medical comorbidity and mobility, ADL and IADL functioning would add to the predictive ability of the original model. Change scores were calculated by subtracting 1-year scores from baseline scores. These analyses, limited to only one follow-up assessment, are exploratory in that they assume changes in health and function contribute to the risk of depression rather than the opposite direction.

Results

The 268 participants in the study had an average age of 77.9 ± 7.7 years and 12.7 years of education. 64% were female, 13% were minority, 16% were in poverty, and 38% were married. No patients in our study sample had a history of major depression as determined by the SCID.

Predictors of Depression Onset at 1 Year

At one-year follow-up, approximately 10% (28/268) of participants developed depression (major depression: 3%; 9/268, and minor depression: 7%; 19/268). In bivariate analyses (see Table 1), baseline factors associated with an increased risk of depression onset at one year included poorer self-rated health, greater pain, greater subthreshold depression severity on the HDRS, and greater number of ADL limitations. Neither medical comorbidity, number of IADL or mobility limitations, or any demographic variables was associated with depression onset at one year. In a multivariate logistic regression model (n=266; see Table 2 Model 1), higher baseline self-rated health was negatively associated (Wald χ^2=8.09, df=1, p=.004), and greater subthreshold depressive symptoms as measured by the HDRS were positively associated (Wald χ^2=5.08, df=1, p=.024), with onset depression. To identify whether specific subgroups of depressive symptoms predicted onset depression, we then substituted the single HDRS measure with the two HDRS subscales (somatic and nonsomatic). Although neither subscale predicted depression onset when both were included in the model, the somatic subscale did predict depression onset (Wald χ^2=3.88, df=1, p=.02,) controlling for self-rated health when entered separately.

Change from baseline to one year in medical and functional status

The final set of analyses explored the impact of change in ADL and IADL disability, mobility, and medical morbidity over the course of the follow-up year on onset depression. In a multivariate logistic regression model (n=245; see Table 2 Model 2), both number of ADL limitations at baseline (Wald χ^2=6.07, df=1, p=.014) and change in ADL functioning from baseline to one year were positively associated (Wald χ^2=5.26, df=1, p=.022) with onset depression, controlling for self-rated health (Wald χ^2=4.15, df=1, p=.042) and the somatic subscale of the HDRS (Wald χ^2=5.92, df=1, p=.015). Changes in IADL disability, mobility and medical comorbidity over the year were not predictive of onset depression

To illustrate the relationship of changes in ADL functioning with onset depression, we divided the sample into four groups (never disabled, improved from baseline to one year, declined from baseline to one year, and disabled at both baseline and one year). Given the distribution for ADL limitations in the sample, “disabled” was dichotomized as either having no ADL limitations (50% of the sample) versus one or more ADL limitations. The incidence of depression at one year ranged from 5% (5/101) in patients who were not disabled at either time period, 11% (11/98) in patients who improved from baseline to one year, 14% (6/41) in patients who worsened from baseline to one year, to 19% (5/26) in patients who were disabled at both time points.

Discussion

In a sample of non-depressed older adults characterized by medical burden and physical disability, 10% of patients developed either major or minor depression in the 12 months following admission to a homecare agency. To the best of our knowledge, this is one of the first studies to investigate onset depression among older, medically compromised adults using longitudinal, clinically informed diagnostic data. Individuals who had more somatic depressive symptoms, poorer subjective sense of health, more ADL limitations at baseline, and declining ADL function over the course of the follow-up year were at greatest risk of developing major or minor depression. Our findings provide support for a specific cluster of variables that can predict onset depression in a high-risk sample of chronically ill, disabled older adults.

The effect of baseline somatic symptoms of depression on risk of depression was evident above and beyond other measures of functional and medical status in these patients. This finding is particularly relevant in older adults because somatic symptoms of depression are common and more readily acknowledged by older adults than psychological or gateway symptoms. Prior research has shown that by treating the somatic symptoms of depression, both overall depression and functional deficits improve (21). While our results are preliminary, recognizing that somatic symptoms are predictive of new onset depression in medically ill patients provides a more focused approach to identifying patients at risk of developing a more serious depressive episode. The utility of this finding for real-world practice may be tempered somewhat given the difficulty in differentiating somatic symptoms associated with depression in patients with medical illness or disability.

Consistent with previous research (5,22), baseline ADL functioning was associated with onset depression. A closer look at changes in ADL functioning over a one-year period revealed some variability in this sample, with some patients reporting disability at both time periods, and others either developing disability or regaining function. These different patterns of ADL disability are consistent with the growing understanding that becoming disabled is not a one-way street, but that levels of disability commonly fluctuate over time (23,24). The importance of this observation for the current study is that both persistent and deteriorating functioning were associated with a greater risk of depression than observed in patients reporting no or improved ADL limitations at one year. Further, ADL, but not IADL limitations predicted onset depression. One explanation for this finding is that because ADL functioning captures “necessary” activities such as bathing, dressing, and eating, ADL functioning may be more independent of current mood than IADL functioning. Our analyses purposely excluded patients who were depressed at baseline, and therefore, it may be these patients for whom the longitudinal relationship between depression and IADL disability is strongest. Moreover, disability in such fundamental functions such as bathing, dressing and other ADLs may be particularly distressing, and thereby more predictive of depression (22). Future research may help us further understand the complex longitudinal relationships between depression and disability in vulnerable older adults (25).

Poor subjective sense of health was also a significant predictor of depression, demonstrating the importance and strength of one's self-assessment of their health on the development of depressive symptoms. Of note, subjective sense of health was predictive whereas more observable phenomena such as medical comorbidity was not. Poor subjective sense of health has been linked to other negative outcomes in the literature including mortality (26), functional limitations (27,28) and physical disability (29). The finding that both perceived health and somatic symptoms of depression independently predicted incident depression indicates that these measures of physical health are not redundant as risk factors for late-life depression. Although an association between initial pain and new onset depression was demonstrated in the bivariate analyses, this relationship was not observable in a multivariate analysis that controlled for somatic symptoms and perceived health; furthermore, the validity of the single SF-36 pain item has not been demonstrated.

Recent studies have been conducted in the Netherlands to examine the cost-effectiveness and clinical utility of interventions to prevent late-life depression (30-32). This group suggests a two-prong approach that includes: 1) *selective prevention*: focusing on selected high-risk groups because logistically the groups may be small enough to be effectively managed and treated, and 2) *indicated prevention:* treating individuals with subsyndromal symptoms of depression (30-31) in the hope of preventing more severe depressive episodes from developing. Their research concluded that indicated prevention was more effective than selective prevention in a primary care setting based on both cost and a higher identification of individuals at risk (32). In the current study, we examined risk factors of onset depression among a high-risk sample, and found that subsyndromal symptoms of depression predicted onset depression.

Considering these findings, we suggest an approach that combines both the indicated and selective prevention approaches by conducting a period of watchful waiting, paying specific attention to patients with mild somatic symptoms of depression and evidencing other high risk factors such as poor self-rated health and fluctuating or poor ADL functioning. Given the large numbers of older adults with somatic depressive symptoms, initially intervening for all patients with somatic symptoms of depression would likely still be time intensive and expensive. A watchful waiting approach is itself complicated in these circumstances as home healthcare patients often move through different sectors of healthcare based on their complicated medical needs. Problems associated with transitions between sectors of care underscore the importance of having these patients properly flagged, and paying particular attention to tracking these individuals from sector to sector to ensure proper and timely depression care can be rendered (33-34).

There are limitations to the current study. First, the data for this study are almost a decade old. The major change in this time period that would be relevant to this population is the increased rate of depression treatment. Because patients on antidepressant medication as well as patients who met diagnostic criteria were excluded from the analyses, it is not clear whether this change would affect the composition of the at-risk group. As we reported previously, the use of antidepressants among the excluded participants with baseline depression in our initial study was low (1). Furthermore, in a more recent study, we found that home health recipients with major or clinically significant minor depression continue to be under-diagnosed and under-treated (35). Also, it is unlikely that the association of incident depression with the clinical and functional risk factors that were analyzed would have changed over this time period. Second, we did not employ complex statistical methods in order to account for change from baseline to one year; however, our goal in this study was to identify predictors of depression rather than describe the intricate relationship between depression and disability. We aimed for a clinically informative and useful model to help guide clinicians and researchers to identify high-risk patients. Lastly, it is possible that our identification of patients with subsyndromal symptoms of depression on the HDRS may not be predictive of onset depression per se, but rather represent

a prodromal episode of depression. Of note, however, these patients did not meet diagnostic criteria for minor depression at the time of baseline assessment.

Conclusion

In a sample of non-depressed older adults characterized by medical burden and physical disability, 10% of patients developed either major or minor depression in the 12 months following admission to a homecare agency. Older disabled adults with poor self-rated health, mild somatic depressive symptoms, a greater number of ADL limitations at baseline and declining ADL functioning are at risk of developing a depressive episode. Our findings help in designing preventive strategies to promote the ongoing good mental health of these high-risk patients over time.

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Table 1

Baseline Demographic, Clinical and Functional Variables Associated with Depression Onset at 1 year (Means and Standard Deviations)

Descriptor	Non-depressed Participants (N=238)	Depressed Participants (N=28)	T test	*df*	*p* value
Pain (SF-36) *(a)*	1.85 (.75)	2.29 (.54)	−3.00	264	.003*
Overall Self-Rated Health *(b)*	2.69 (.75)	2.21 (.74)	3.21	264	.001*
Future Self-Rated Health *(c)*	4.03 (.97)	3.88 (1.03)	.722	250	.471
Mini Mental Status Exam	26.68 (3.18)	27.14 (2.18)	−.750	266	.454
Medical Burden (Charlson Comorbidity Index)	2.20 (1.83)	2.39 (1.91)	−.525	266	.600
Hamilton Depression Rating Scale Total Score	3.65 (3.35)	5.43 (3.61)	2.64	266	.009*
Somatic subscale	3.08 (2.76)	4.29 (2.98)	−2.15	260	.033*
Non-somatic subscale	.409 (1.01)	.821 (.98)	−2.05	261	.041*
Social Interaction (subscale of Duke)	6.06 (2.67)	5.25 (2.14)	1.55	262	.122
Subjective (subscale of Duke)	19.44 (2.02)	19.00 (2.36)	1.06	262	.288
Instrumental (subscale of Duke)	8.73 (2.23)	8.68 (2.35)	.112	262	.911
# of ADL Limitations *(d)*	.55 (.97)	1.23 (1.47)	−3.22	253	.001*
# of IADL Limitations *(e)*	2.41 (1.64)	2.77 (1.90)	−1.03	253	.300
# of Mobility Limitations *(f)*	1.30 (1.10)	1.42 (1.13)	−.533	253	.595
Years of Education	12.88 (3.78)	12.07 (2.46)	1.10	266	.272
Age	78.00 (7.76)	76.61 (7.61)	.897	266	.370
Marital Status			χ^2 test	*df*	*p* value
Married	86 (87%)	12 (12%)	2.28	1	.131
Widowed	105 (94%)	7 (6%)			
Gender					
Men	89 (93%)	7 (7%)	1.59	1	.207
Women	151 (88%)	21 (12%)			
Race/Ethnicity					
White	208 (90%)	24 (10%)	.845	1	.845

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Descriptor	Non-depressed Participants (N=238)	Depressed Participants (N=28)	T test	*df*	*p* value
Minority	31 (89%)	4 (11%)			
Income					
Poverty	36 (80%)	9 (20%)	3.13	1	.077
Non-Poverty	126 (90%)	14 (10%)			

Note:

*p=<.05

*(a)*Pain was dichotomized as “None” and “A little bit”/A great deal”

*(b)*Overall self-rated health. Possible score range from 1-4, with a higher score indicating a more positive outlook.

*(c)*Overall future-rated health. Possible score range from 1-5, with a higher score indicating a more positive outlook.

*(d)*Number of ADL, IADL and mobility limitations. Possible score ranges from 0-6, with a higher score indicating greater limitations in that domain.

*(e)*Number of ADL, IADL and mobility limitations. Possible score ranges from 0-6, with a higher score indicating greater limitations in that domain.

*(f)*Number of ADL, IADL and mobility limitations. Possible score ranges from 0-6, with a higher score indicating greater limitations in that domain.

Table 2

Logistic Regression Predicting Depression Onset at 1 Year

Variable	Odds Ratio	Wald Confidence Intervals (95%)	*p* value
Model 1 (n=266)			
Subjective Current Health	.47	.28 - .79	.004*
Depressive Symptoms (HDRS)	1.12	1.02 - 1.25	.024*
Intercept	.434	-	.243
Model 2 (n=245)			
Subjective Current Health	.53	.29 -.98	.042*
Somatic Subscale (HDRS)	1.19	1.04 -1.38	.015*
# of ADL Limitations	1.63	1.10 -2.39	.014*
Change in # of ADL Limitations	1.59	1.07 -2.35	.022*
Intercept	.191	-	.062

Note:

Odds ratios were tested with Wald-chi square tests, df=1.

Model 1= −2 log likelihood chi-square=161.36, df=2, p=.002

Model 2= −2 log likelihood chi-square=141.53, df=4, p=.001

Subjective Current Health was reversed scored so the higher the score the better rating of current health (4-Excellent, 3 Good, 2 Fair, 1 Poor).

Model 2 used the somatic subscale from the HDRS 17 as a predictor of onset depression including somatic symptoms, loss of weight, insomnia early, middle, and late, somatic symptoms general, anxiety somatic, and hypochondriasis.

Variables that were not significant and thus excluded from the final model included pain, medical comorbidity, nonsomatic items of the HDRS, IADL functioning, and all demographic factors (age, sex, income, and marital status)