



Published in final edited form as:

*Psychiatr Serv.* 2010 January ; 61(1): 78–80. doi:10.1176/appi.ps.61.1.78.

## Depression and Increased Short-Term Hospitalization Risk Among Geriatric Patients Receiving Home Health Care Services

**Thomas Sheeran, Ph.D., M.E.,**

Department of Geriatric Psychiatry, Weill Cornell Medical College, 21 Bloomingdale Rd., White Plains, NY 10605 (ths2007@med.cornell.edu)

**Amy L. Byers, Ph.D., M.P.H., and**

Department of Psychiatry, University of California, San Francisco

**Martha L. Bruce, Ph.D., M.P.H.**

Department of Geriatric Psychiatry, Weill Cornell Medical College, 21 Bloomingdale Rd., White Plains, NY 10605

### Abstract

**Objective**—This study evaluated the association between depression and hospitalization among geriatric home care patients.

**Methods**—A sample of 477 patients newly admitted to home care over two years was assessed for depression. Bivariate and logistic regression analyses examined the likelihood of hospitalization during a 60-day home care episode.

**Results**—The hospitalization rate was similar for the 77 depressed patients and 400 nondepressed patients (about 7%). However, mean time to hospitalization was 8.4 versus 19.5 days after start of care, respectively. Hospitalization risk was significantly higher for depressed patients during the first few weeks. A main effect for depression and a depression-by-time interaction was found when analyses controlled for medical comorbidity, cognitive status, age, gender, race, activities of daily living and instrumental activities of daily living, and referral to home care after hospitalization.

**Conclusions**—Depression appears to increase short-term risk of hospitalization for geriatric home care patients immediately after starting home care.

Hospitalization of older patients receiving home health care is a severe and costly outcome. It can increase the risk of functional decline, adverse medical events, and mortality (1,2). The estimated cost to Medicare of unplanned hospitalizations in 2004 was \$17.4 billion (3). Because the majority of home health care patients are referred from hospitals, their rehospitalization contributes to recently reported high national rates of hospital readmissions of Medicare beneficiaries (19.6%) (3). Among home health agencies certified by the Centers for Medicare and Medicaid Services (CMS), hospitalization is one of 13 adverse event indicators in the CMS-reported Outcome Based Quality Improvement program.

In this study, we examined the association between depression and hospitalization among older adults receiving Medicare-certified home health care services. Although little is known about the impact of depression on hospitalization of patients receiving home care, depression has been found to predict both hospitalization and mortality in other populations (4,5). Given reported rates of depression as high as 25% in home care, a link between depression and

hospitalization may have implications for how CMS prioritizes depression care (6). It also may suggest approaches for how home health agencies can decrease the rate of this adverse outcome.

Using research interview data and clinical data from a home care agency, this analysis tested the hypothesis that a research diagnosis of major or minor depression increased the risk of hospitalization.

## Methods

Study procedures were approved by the Cornell Institutional Review Board. A detailed description of procedures can be found in our original report (6). Briefly, participants were elderly home care patients newly admitted over two years (December 1997 to December 1999) to a traditional, not-for-profit, Medicare-certified home health agency serving a 450-square-mile county north of New York City. Our sample consisted of 539 patients aged 65 years or older who were newly admitted to home care, able to give informed consent, and English or Spanish speaking. Written informed consent was obtained from all participants. Of the 539 patients in the sample, 62 were excluded from this analysis because of incomplete data in the discharge disposition record, leaving a final sample of 477. Excluded patients did not differ from the final sample in demographic characteristics, and demographic characteristics of the final sample matched those of the national population of home care patients (6,7).

Data were from research interviews and agency medical records and reflect disposition at discharge from the first episode of home care, defined by CMS as a 60-day capitated reimbursement period. The four most common types of disposition were to home, a hospital, or another health care setting or recertified for another 60-day episode of home care (6). Depression status was assessed by the Structured Clinical Interview for DSM-IV, which was administered by trained research associates who were monitored by interrater reliability ratings (8). Other research instruments included the Charlson Comorbidity Index, the Mini-Mental State Examination (MMSE), assessment of activities of daily living and assessment of instrumental activities of daily living with the Multi-Level Assessment Instrument (9–11). Agency data comprised clinical and administrative information, including referral source, admission date, discharge date, demographic data, and hospitalization.

To describe the sample, we used univariate analyses, with means for continuous variables and frequencies for categorical variables. We first modeled risk of hospitalization using Cox proportional hazards survival models, but these models did not converge because of gradual discharge of patients (mostly to home) per normal home care procedures, which resulted in a large number of censored observations. We reverted to logistic regression, entering time as a covariate, and tested the interaction between time and depression. Other control variables included age, gender, race, activities of daily living, instrumental activities of daily living, Charlson score, MMSE score, and referral to the current episode of home care after hospital discharge. Analyses were carried out with SAS, version 9.1.3.

## Results

The 477 participants had a mean±SD age of 78.5±7.5 years. A total of 315 (66%) were female; 404 patients (85%) were Caucasian, 52 (11%) were African American, 17 (4%) were Hispanic, and four (<1%) were from other racial-ethnic groups.

The participants had significant medical comorbidity (mean Charlson score=2.7±2.1; sample scores ranged from 0 to 10, with higher scores indicating greater comorbidity). Disability levels were also high (score for instrumental activities of daily living, 3.4±1.5; score for activities of daily living, 1.1±1.3; possible scores range from 0 to 6 on both, with higher scores indicating

greater disability). Eighty-three patients (17%) scored lower than 24 on the MMSE (scores from 24 to 30 suggest little or no cognitive impairment).

Approximately one-quarter of the 477 patients met criteria for either major depression (N=77, 16%) or minor depression (N=39, 8%). During the 60-day episode of home care, 35 (7%) were hospitalized; the others were discharged to home (that is, self-care) (N=417, 87%) or other health care settings (N=22, 5%), or the episode of home care expired or another episode was begun (N=3, <1%).

Over the full 60-day period of analysis, the hospitalization rates of patients with depression (9%) and without depression (7%) did not differ significantly. However, time until hospitalization differed significantly between these two groups:  $8.4 \pm 5.5$  days for patients with depression and  $19.5 \pm 12.8$  days for patients without depression ( $t=3.58$ ,  $df=33$ ,  $p<.001$ ). The difference in likelihood of hospitalization was noted immediately after patients started home care. Depressed patients had higher hospitalization rates than nondepressed patients at 14 days (eight of 116 patients, or 7%, compared with nine of 361 patients, or 3%;  $\chi^2=4.95$ ,  $df=1$ ,  $p=.03$ ). Among all hospitalized patients in the sample, eight of ten (80%) patients with depression were hospitalized by the second week after the start of services compared with nine of 25 (36%) patients without depression. This effect diminished over time, and no overall difference was noted by the end of the 60-day home care episode. These results suggested a main effect for depression and a depression-by-time interaction.

We subsequently modeled this effect using logistic regression to test the effect of the interaction between depression and duration of service on the likelihood of hospitalization. We controlled for significant covariates by including in the model variables with a  $p$  value of  $<.1$ , which included continuous measures for medical morbidity based on the Charlson score (odds ratio [OR]=1.33; 95% CI=1.14–1.54;  $p<.001$ ) and MMSE score (OR=.90; 95% CI=.82–.99;  $p=.025$ ).

There was a main effect for depression ( $\beta=1.29$ ,  $SE=.61$ , Wald  $\chi^2=4.41$ ,  $df=1$ ,  $p=.036$ ) but no main effect for duration of service (Figure 1). When the analysis controlled for medical comorbidity and cognitive status, the effect on hospitalization of the interaction between depression and duration of service was statistically significant ( $\beta=-.098$ ,  $SE=.04$ , Wald  $\chi^2=6.17$ ,  $df=1$ ,  $p=.013$ ). As shown in Figure 1, the interaction represents a strong, positive effect of depression on risk of hospitalization that diminished over time, with the odds approaching one by the second week of care. Age, gender, race, activities of daily living, instrumental activities of daily living, and referral to the current home care episode from a hospital were not associated with hospitalization and did not affect the interaction term.

## Discussion and conclusions

The major finding of this analysis was that although depression did not appear to affect overall hospitalization rates, it was associated with an increased risk during the early weeks of home care. During the first two weeks of home care, the hospitalization rate for depressed patients was more than twice as high as the rate for nondepressed patients. The decreasing risk of hospitalization associated with depression over time was statistically significant, indicating an interaction between depression and time.

Our analyses controlled for numerous demographic and clinical covariates, which indicated a health risk associated with depression beyond the risk associated with medical comorbidity, cognitive impairment, and recent hospitalization. It is not yet known whether depression directly affects disease processes (for example, hypertension) or disease management behaviors (for example, treatment adherence) or is a marker for other unique but unknown factors that may put this group at higher risk than their nondepressed counterparts.

Recent research has found that up to one-fifth of Medicare patients are rehospitalized within 30 days of hospital discharge (3). Because many patients who receive home care services have been referred to home care after hospital discharge, our results are relevant to the Medicare finding because they suggest that depression may contribute to the high rate of rehospitalization.

These findings may have clinical and policy implications. Clinically, the results suggest that improved depression treatment not only may improve direct outcomes for geriatric depression but also may reduce adverse medical events (12). Although it is not yet clear whether depression treatment would prolong time to hospitalization or prevent it, one study has demonstrated reduced hospitalization rates for patients receiving home care when depression was targeted (5).

The findings presented here underscore the importance of focusing on depression in Medicare's efforts to improve the quality of home care. Indeed, CMS has recently increased attention to depression by adding the Patient Health Questionnaire 2 to the 2010 Home Care Outcome and Assessment Information Set (13). Our own research has demonstrated that nurses can be trained to assess depression (14). Hospitalization is an adverse event of central importance to CMS, because it is both an expensive form of health care and a prognostic indicator of poor outcomes among elderly patients (15). Evidence that depression is related to subsequent hospitalization and other adverse events suggests that creating incentives for depression care not only may directly improve the treatment of this widespread problem in home care but also may have an impact on other health status indicators that Medicare monitors.

An important limitation of this study is that we do not know what happened to the depressed patients after hospitalization, whereas their nondepressed counterparts either remained in home care or were discharged to home or other services. Thus we do not know whether they needed additional health services after hospitalization, with the associated additional expenses. A second limitation is that the depression-by-time interaction provides little if any information about a mechanism of causation.

Another limitation is that this analysis combined research and administrative data. Because administrative data typically are collected in a less rigorous fashion than research data, there is a greater need to replicate these findings. Conversely, an important strength of using routine clinical data lies in its immediate availability to real-world application by home care agencies, increasing potential use of findings such as ours. Finally, even though our sample is similar to the national population, it nevertheless was drawn from one agency, which limits generalizability. Overall, however, these findings add to the accumulating evidence that geriatric depression not only is a serious illness in its own right but also may have an adverse impact on other disease and health outcomes.

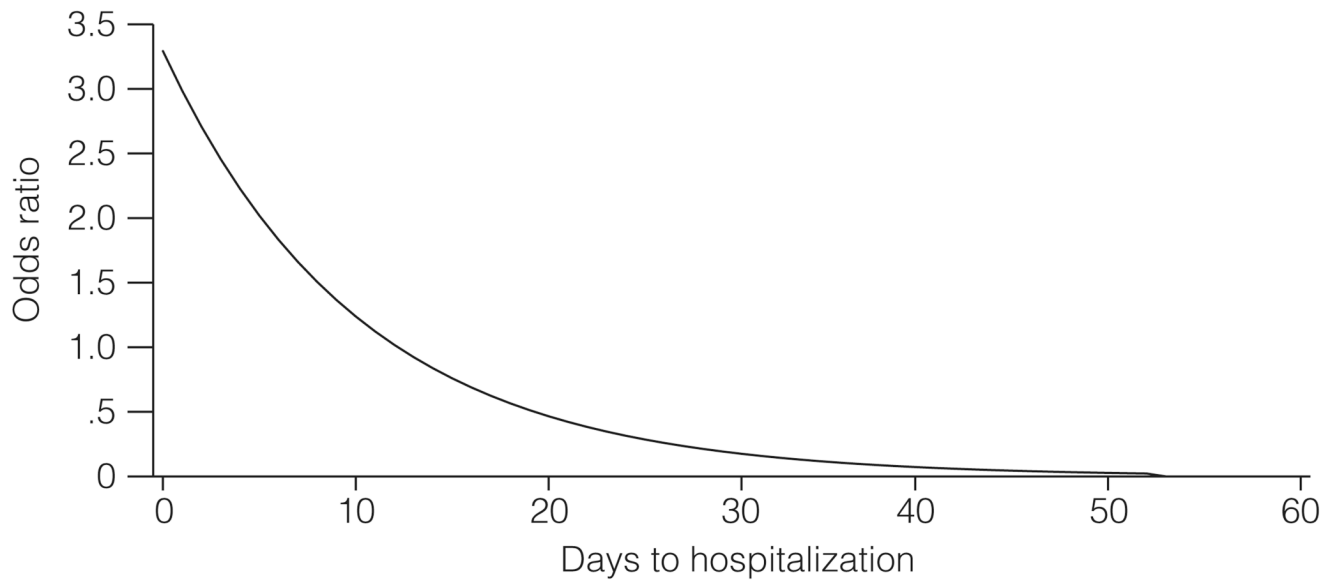
## Acknowledgments

This work was supported by grants R24-MH064608, K01-MH073783, and K01-MH 079093 from the National Institute of Mental Health. The authors thank the nurses, other clinicians, administrators, and management staff of the Visiting Nurse Services in Westchester, New York, for their participation and support for this research.

## References

1. Creditor MC. Hazards of hospitalization of the elderly. *Annals of Internal Medicine* 1993;118:219–223. [PubMed: 8417639]
2. Leape LL, Berwick DM. Five years after To Err Is Human: what have we learned? *JAMA* 2005;293:2384–2390. [PubMed: 15900009]
3. Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. *New England Journal of Medicine* 2009;360:1418–1428. [PubMed: 19339721]

4. Rumsfeld JS, Jones PG, Whooley MA, et al. Depression predicts mortality and hospitalization in patients with myocardial infarction complicated by heart failure. *American Heart Journal* 2005;150:961–967. [PubMed: 16290972]
5. Flaherty JH, McBride M, Marzouk S, et al. Decreasing hospitalization rates for older home care patients with symptoms of depression. *Journal of the American Geriatrics Society* 1998;46:31–38. [PubMed: 9434663]
6. Bruce ML, McAvay GJ, Raue PJ, et al. Major depression in elderly home health care patients. *American Journal of Psychiatry* 2002;159:1367–1374. [PubMed: 12153830]
7. Munson ML. Characteristics of elderly home health care users: data from the 1996 National Home and Hospice Care Survey. *Advance Data* 1999;309:1–11. [PubMed: 11067566]
8. First, M., Spitzer, R., Gibbon, M., et al. *Structured Clinical Interview for DSM-IV Axis I Disorders (SCID)*. Washington, DC: American Psychiatric Press; 1995.
9. Charlson ME, Pompei P, Ales KL, et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *Journal of Chronic Diseases* 1987;40:373–383. [PubMed: 3558716]
10. Folstein MF, Folstein SE, McHugh PR. “Mini-mental state”: a practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research* 1975;12:189–198. [PubMed: 1202204]
11. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist* 1969;9:179–186. [PubMed: 5349366]
12. Byers A, Sheeran T, Mlodzianowski A, et al. Depression and risk for adverse falls in older home health care patients. *Research in Gerontological Nursing* 2008;1:245–251. [PubMed: 20077999]
13. Li C, Friedman B, Conwell Y, et al. Validity of the Patient Health Questionnaire 2 (PHQ-2) in identifying major depression in older people. *Journal of the American Geriatrics Society* 2007;55:596–602. [PubMed: 17397440]
14. Bruce ML, Brown EL, Raue PJ, et al. A randomized trial of depression assessment intervention in home health care. *Journal of the American Geriatrics Society* 2007;55:1793–1800. [PubMed: 17916119]
15. Sleiman I, Rozzini R, Barbisoni P, et al. Functional trajectories during hospitalization: a prognostic sign for elderly patients. *Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* 2009;64:659–663.



**Figure 1.**

Odds of hospitalization associated with depression over time<sup>a</sup>

<sup>a</sup> Figure derived from a logistic regression model including log odds parameters of depression ( $\beta=1.29$ ,  $SE=.61$ ,  $Wald \chi^2=4.41$ ,  $df=1$ ,  $p=.036$ ), days in care ( $\beta=.008$ ,  $SE=.01$ ,  $Wald \chi^2=.35$ ,  $df=1$ ,  $p=.553$ ), and the interaction terms ( $\beta=-.098$ ,  $SE=.04$ ,  $Wald \chi^2=6.17$ ,  $df=1$ ,  $p=.013$ ) and controlling for Mini-Mental State Examination score and medical morbidity