

# Depression and Mortality in Elders Referred for Geriatric Psychiatry Consultation

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**Objective:** The association between depressive symptoms and mortality was assessed in a 7-year longitudinal follow-up of subjects referred for geropsychiatric consultation.

**Methods:** The medical records of 89 referrals were reviewed. Survival analysis was performed on subjects stratified by Geriatric Depression Scale (GDS) and residential status.

**Results:** Fifty percent of subjects with GDS > 6 (n = 28) died by 19 months versus 54 months for subjects with

GDS < 7 (n = 61) ( $\chi^2 = 13.2$ ,  $df = 1$ ,  $P < .001$ ). GDS, medical burden, age, and gender were independently associated with survival.

**Conclusions:** GDS scores greater than 6 are associated with increased risk of mortality in elders referred for geropsychiatric consultation. (*J Am Med Dir Assoc* 2007; 8: 318–321)

**Keywords:** Depression; mortality; elders; longitudinal cohort

Studies examining the relationship between depression and mortality in elders have been mixed. Although some studies report negative findings,<sup>1–3</sup> others describe significant associations between depression and increased mortality in *community-dwelling* retirees even after adjusting for medical co-morbidities.<sup>4,5</sup> It was recently reported that community-dwelling retirees with 6 or more self-reported symptoms of depression on the 15-item Geriatric Depression Scale (GDS) (n = 988) were 27% more likely to die than those with fewer than 6 symptoms (n = 12,109) over a 3-year period (95% confidence interval [CI] = 1.11–1.45).<sup>5,6</sup> The association between depression and mortality persisted after adjusting for comorbidities, disability, and lifestyle.

Conflicting results are also reported in *institutionalized* elders. One group reported that the diagnosis of Major Depressive Disorder, but not the mere presence of depressive symp-

toms, was associated with a 59% higher mortality rate during the first year of nursing home placement.<sup>7</sup> Another group found that depressive symptoms alone were associated with increased mortality over a 4-year period in nursing home patients.<sup>8</sup> The discrepancy between positive and negative studies may be related to methodological differences. In general, studies that examine acutely ill populations, measure only *symptoms* of depression, or have brief follow-up periods are less likely to report significant associations between depression and mortality.

No studies have reported the relationship between depression and mortality in nursing home or community-dwelling residents referred for psychiatric consultation. Depression is often underrecognized by treatment teams in institutional settings.<sup>9</sup> Referred patients may have improved survival outcomes secondary to disease recognition by the treatment team followed by a positive response to treatment recommendations; however, poor outcomes are also possible secondary to either a more severe disease process declaring itself to the treatment team or failure of treatment recommendations to improve survival.

Given that the GDS can be easily used by all geriatric health care providers, it would be useful to know if high scores are associated with increased mortality. The purpose of this study is to determine if high GDS scores are associated with increased mortality among nursing home and non-nursing home residents referred for geropsychiatric consultation. Our hypothesis is that GDS scores will inversely correlate with survival and that among elders with elevated scores, those residing in nursing home settings will have a higher mortality rate than those in non-nursing home settings.

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## METHODS

### Subjects and Setting

This project was approved by The University of Texas Health Science Center at San Antonio Institutional Review Board. Medical charts belonging to subjects residing in a continuing care retirement community referred for geropsychiatric consultation between 1991 and 1994 were selected for review. To be included, subjects had to have a documented 15-item GDS score as a part of the psychiatric consultation.

Residents living in independent living apartments; residential apartments with community dining; or intermediate care facilities with housekeeping, medication assistance, and some supervision were classified as “non–nursing home residents.” Those living in a skilled nursing unit or an Alzheimer’s disease unit were classified as “nursing home residents.”

### Data Collection

Subjects were initially assessed for depression at time  $t_1$  with both a clinical interview and administration of the GDS. The Mini Mental State Exam (MMSE), Executive Interview (EXIT25), and Cumulative Illness Rating Scale (CIRS) were used to assess general cognition, executive function, and medical illness burden, respectively.<sup>10–12</sup> Other recorded data included the subjects’ age, gender, years of education, number of prescribed medications, and residential status at  $t_1$ .

In June 1998, the authors reviewed the residential charts of all subjects to determine current status within the community. Time  $t_2$  was defined as date of death, date of final transfer from the facility, or the current date if the subject was still living at the community. The authors extracted information pertaining to the subjects’ terminal events from the residential record. Cause of death and terminal diagnoses were obtained from either a death certificate, if available, or from the facility or hospital medical record.

### Data Analysis

Subjects were classified according to GDS performance—those with a high depression symptom burden (GDS > 6) and those with a low depression symptom burden (GDS < 7). Mean age, education, gender, MMSE, EXIT25, CIRS, and number of medications were compared between each group using either *t*-test or chi-square analysis. Kaplan-Meier survival curves were calculated and log-rank tests were used to search for survival differences between those with high versus low GDS scores in the entire sample and stratified by residential status.

Age, gender, residential status, MMSE, EXIT25, CIRS, number of medications, and GDS were entered into a Cox Proportional Hazards model to search for independent associations with survival. Alpha was set to 0.05 and Systat 11 was used for all statistical analyses (Systat Software, Inc, Point Richmond, CA).<sup>13</sup>

## RESULTS

### Sample Characteristics

There were 170 referrals between 1991 and 1994. Eighty-nine subjects had a documented GDS score and were included

**Table 1.** Characteristics of High GDS versus Low GDS Elders Referred for Geropsychiatric Consultation\*

	GDS > 6 (n = 28)	GDS < 7 (n = 61)
Age (SD)	85.5 (8.2)	84.4 (6.2)
Education (SD)	12.4 (3.9)	12.3 (3.7)
Male (%)	5 (18)	16 (26)
Nursing home (%)	13 (46)	23 (38)
MMSE (SD)	18.4 (6.9)	18.6 (7.6)
EXIT25 (SD)	22.8 (9.1)	22.7 (8.1)
CIRS (SD)	9.6 (7.1)	7.5 (5.4)
Number of medications (SD)	7.2 (2.9)	6.4 (3.6)

GDS, Geriatric Depression Scale (0–15); MMSE, Mini Mental State Exam (0–30); EXIT25, The Executive Interview (0–50); CIRS, Cumulative Illness Rating Scale (0–56).

\* No significant between group differences for any characteristic.

for data analysis. The mean survival time for these patients was not significantly longer than that of subjects who were not administered the GDS (by Log-rank test;  $\chi^2 = 1.23$ ,  $df = 1$ ,  $P = .27$ ). There were 36 nursing home residents and 53 non–nursing home residents at  $t_1$ . By June 1998, all but 17 subjects had left the community because of death or transfer to another care facility. Subjects with high GDS scores ( $n = 28$ ) did not differ from those with low GDS scores ( $n = 61$ ) with respect to age, education, gender, MMSE, EXIT25, level of care, CIRS scores, or the number of prescribed medications (Table 1).

### Survival Analysis

Fifty-one (57.3%) subjects had died by follow-up. Twenty cases left the retirement community alive and were lost to follow-up. The mean time from diagnosis to death was 29.8 months (median = 26.6 months). A cause of death could be ascertained from available records in 36 cases. The most common causes of death were respiratory illness ( $n = 15$ ), cardiovascular disease ( $n = 7$ ), and cerebrovascular accident ( $n = 3$ ).

Among subjects with high GDS scores, 50% died by 19 months after their consultation versus 54 months for subjects with low scores ( $\chi^2 = 13.2$ ,  $df = 1$ ,  $P < .001$ ). There was no statistical difference in survival between subjects scoring 0 on the GDS versus those scoring 1 to 6 ( $\chi^2 = 0.041$ ,  $df = 1$ ,  $P = .84$ ). No cause of death was more likely to be associated with high GDS scores. Unlike GDS stratification, there was no difference in survival curves for nursing home versus non–nursing home residents ( $\chi^2 = 0.041$ ,  $df = 1$ ,  $P = .84$ ).

Figure 1 presents survival curves stratified by residential status at the time of the original psychiatric consultation. Among nursing home subjects, 50% of those with high GDS scores ( $n = 13$ ) had died by 6 months after their consultation versus 45 months for those with low scores ( $n = 23$ ) ( $\chi^2 = 7.05$ ,  $df = 1$ ,  $P = .008$ ). Among non–nursing home subjects, 50% of those with high GDS scores ( $n = 15$ ) had died by 19 months after their consultation versus 59 months for those with low scores ( $n = 38$ ) ( $\chi^2 = 6.13$ ,  $df = 1$ ,  $P = .01$ ). The survival of noninstitutional patients with high GDS scores

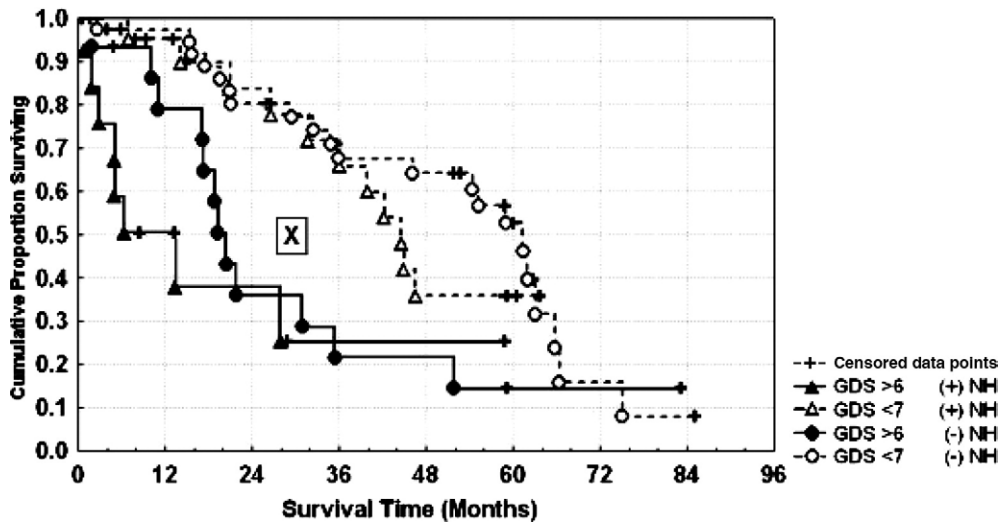


Fig. 1. Cumulative proportion surviving with and without clinically significant depressive symptoms by level of care. "X" marks mean survival for the entire cohort. GDS, 15-item Geriatric Depression Scale; (+) NH, nursing home placement, (-) NH, independent or assisted living.

was actually marginally worse than institutionalized, but non-depressed patients with low GDS scores ( $\chi^2 = 3.74$ ,  $df = 1$ ,  $P = .053$ ).

### Multivariate Analysis

In the Cox Proportional Hazards regression model, only GDS ( $t = 2.25$ ,  $P = .03$ ), CIRS ( $t = 3.41$ ,  $P = .001$ ), age ( $t = 2.17$ ,  $P = .03$ ), and gender ( $t = 2.16$ ,  $P = .03$ ) made significant independent contributions to survival. MMSE, EXIT25, residential status, and the number of medications did not.

### DISCUSSION

We have confirmed a robust adverse effect of high GDS scores on survival among elders referred for geropsychiatric consultation. Unfortunately, our analysis is limited by a number of considerations. First, these patients were all referred by primary care providers for specialty consultation. As such, they may not be typical of "depressed" patients. However, these data do not appear to reflect a "specialist" case-mix selection bias as (1) noninstitutionalized residents with high GDS scores exhibited worse survival than nursing home residents with lower GDS scores, and (2) patients with depressive symptoms, referred for expert consultation, nonetheless had no significantly increased risk of mortality, relative to those without depressive symptoms, provided that their GDS score was between 1 and 7. Previous studies are consistent with a graded association between GDS scores and mortality. Those that use a threshold greater than 6 consistently show a significant effect on survival that is both independent of medical comorbidity and accentuated at higher GDS scores,<sup>5,14</sup> whereas those that use lower GDS cut-points (ie,  $\geq 4$  points) inconsistently demonstrate this association.<sup>15,16</sup>

Secondly, we classified subjects on the basis of GDS scores, not clinical diagnoses. Although a clinical diagnosis was made during the initial evaluation, a structured assessment was not performed. However, we have previously shown that GDS

scores greater than 6 accurately predict the results of structured clinical assessments at our institution.<sup>17</sup> Also, the survival times we report here in the first year appear to agree with methodologically rigorous studies, albeit of shorter duration, that have been performed in nursing home settings.<sup>7,18</sup>

We found no significant associations between cause of death and high GDS scores. It may be that death certificates are too limited in their detail and that hospital records (for which we did not have access) might have provided more information. Indeed, most patients died without perimortem hospitalizations, and sparse formal medical records were kept at the noninstitutionalized levels of care. However, high GDS scores had a significant effect on survival even after adjusting for cognition (including executive function), CIRS scores, institutionalization, age, and the number of medications prescribed. Similarly, previous studies have demonstrated that the effect of major depression or depressive symptoms on survival is independent of comorbid conditions. Thus, it is increasingly clear that depression's effect on survival may not be mediated by comorbid medical disorders, even though these same conditions increase the risk of depressive diatheses.

Regardless of these uncertainties, elevated GDS scores should be considered a poor prognostic indicator in elderly patients, especially considering that many deaths occurred in noninstitutionalized cases, and that the effect of a high GDS score on survival was actually stronger than that of institutionalization status. Moreover, our finding of a potential threshold effect in the association between GDS and survival is of tremendous practical significance as the GDS is a widely available and easy to administer assessment tool.

In summary, GDS scores greater than 6, even in noninstitutionalized retirees, are associated with increased mortality in the elderly. This effect is independent of medical comorbidities and suggests an intrinsic risk associated with depressive symptoms per se. Moreover, there may be a threshold effect in the relationship between depressive symptoms and mortality.

Future studies should clarify the depressive symptom(s) that best define the elderly population at risk, search for the mechanism(s) that mediate depression's independent effects on survival, extend these observations to younger persons, and examine the effect of antidepressant treatment and/or geropsychiatric consultation recommendation adherence on survival in depressed elders.

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