

# Depressed mood in a cohort of elderly medical inpatients: Prevalence, clinical correlates and recognition rate<sup>1</sup>

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**ABSTRACT.** The objectives of this prospective cohort study were to 1) determine the prevalence of depressed mood, 2) identify the characteristics associated with it, and 3) evaluate the recognition rate of depressed mood by clinicians. The study population was a cohort of 401 elderly patients, aged 75 years and older, admitted to the internal medicine service of a tertiary care academic medical center in Western Switzerland over six months. We excluded patients with severe cognitive impairment, terminal disease or those living in a nursing home. Data on demographics, medical, physical, social and mental status were collected upon admission. Presence of depressed mood was defined as a score  $\geq 6$  on the Geriatric Depression Scale (GDS), short form (15-item). An independent reviewer performed a discharge summary abstraction to assess recognition rate. Subjects mean age was 82.4 years, 60.9% were women. Overall, 90 patients (22.4%) had an abnormal GDS score ( $\geq 6$ ). Compared to those without a depressed mood, these subjects were (all  $p < 0.05$ ) older (83.5 vs 82.0 years), more frequently living alone (66.7 vs 55.0%), dependent in both basic activities of daily living (BADL) and instrumental ADL (48.9 vs 36.0%, and 91.1 vs 84.9%, respectively), and cognitively impaired (47.8 vs 27.7% with MMSE score  $< 24$ ). In addition, they had more comorbidities (Charlson index 1.6 vs 1.2). In multivariate analysis, an independent association remains for subjects living alone (OR 1.8, 95%CI 1.1-3.0), with cognitive impairment (OR 1.9, 95%CI 1.1-3.2), and comorbidities (OR 1.3 per point, 95%CI 1.1-1.5). Detection rate during the index hospitaliza-

tion was only 16.7% (15/90). In conclusion, depressed mood was frequent but rarely detected in this population. These findings emphasize the need to improve screening efforts, and to develop additional strategies such as using a pre-screening question to enhance clinical recognition.

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## INTRODUCTION

Depression is the most frequently occurring psychiatric problem in elderly persons, and hospitalized elderly particularly seem at increased risk (1-6). Interaction between depression and physical illness is complex. Several prospective studies of elderly persons in community and institutional settings, including general medical inpatients as well as patients suffering from specific conditions such as acute myocardial infarction, have shown independent associations between depression and mortality (7-15). For example, in this latter study of patients hospitalized with myocardial infarction, those with major depression were more than three times as likely to die over a 6-month follow-up period than those without depression (15). Of note, the reduced survival time of depressed patients observed in these studies was not explained by greater disease severity or greater levels of comorbid illness (7-15). Depression has also been consistently associated with an increased risk of functional status decline (3, 16-19). Indeed, a recent systematic review of risk factors for functional decline in elderly persons revealed that depression is one of the factors whose link to functional decline had the

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highest strength of evidence (16). As a consequence, depression has also been associated with increased health services utilization, and cost (20-22).

Despite these observations and evidence of treatment efficacy (23, 24), studies in different settings have shown that depressive problems remain undetected and untreated in 50 to 90% of elderly inpatients (3, 25-27). To enhance detection, one strategy has been to identify patient characteristics associated with the presence of depressive problems (2, 7, 27-32). However, these studies were limited to small or selected populations, or lacked adequate adjustment for co-morbidities in multivariate models. While functional impairment, lack of social support, and severity of medical illnesses have been identified as risk factors in most studies, the significance of age, gender, race or cognitive impairment remains controversial (7, 27-32). In addition, these studies took place almost wholly in the US and British health care environment, and primarily in nursing homes and community settings. Finally, studies have differed in the method of assessment and criteria used to define depression.

We decided to examine the issues of depressed mood prevalence, risk factors, and detection in our acute health care environment. We used data from a cohort of elderly hospitalized patients enrolled in a larger study on functional assessment in the acute care setting. The objectives of this study were to 1) determine the prevalence of depressed mood in a cohort of elderly medical inpatients, 2) identify clinical characteristics associated with the presence of depressed mood, and 3) evaluate the detection rate of depressed mood by hospital physicians.

## SUBJECTS AND METHODS

### *Study population and setting*

Potential participants were alternate patients aged 75 years and over admitted to the internal medicine service of an academic medical center located in Western, French-speaking Switzerland, over a 6-month period. From the original 649 patients, 135 (20.8%) were not included because they stayed less than 48 hours in the hospital (N=10), were already living in a nursing home (N=43), were transferred from a regional or out of state hospital for an elective procedure (N=32), or had private insurance (N=50). These latter patients were not included because of the inability to access the administrative and follow-up data needed for the larger study.

In addition, 106 (16.3%) were excluded because of their inability to answer questions due to severe cognitive impairment (defined as the inability to give

his/her name and date of birth, N=29), aphasia or stroke (N=9), unstable medical conditions, including patients admitted to intensive care units (N=20), terminal illness or coma (N=23), or other reasons (e.g., language barrier) (N=25). In addition, 7 patients (1.1%) refused to participate in the study. Thus, a total of 401 patients were eventually recruited. Excluded patients had a similar age and gender distribution but, as expected, died more frequently during their hospital stay (25.0% vs 5.0%,  $p < 0.005$ ). The study was approved by the institutional review board of the Faculty of Medicine, University of Lausanne, Switzerland. Written informed consent for participation was obtained from each patient.

### *Data collection*

Within 48 hours of admission, a trained research nurse interviewed the patients at bedside. Data were collected using a structured instrument, and included demographics, living situation, educational level, self-rated income, informal help, mobility, as well as basic activities of daily living (BADL) (33) and instrumental activities of daily living (IADL) (34). For ADL measures, a patient was considered dependent in an activity if unable to perform the task without assistance. Self-perceived health status, cognitive status [Folstein's Mini Mental State Exam (MMSE), (35)] and affective status [Yesavage's Geriatric Depression Scale, short form (GDS), (36)] were also assessed. Because the GDS focuses on the non-somatic symptoms of depression, this scale appears especially appropriate in populations of acutely ill elderly patients. The short form used in this study was derived from a previously validated French version (37). Weekly meetings were used to review functional status data quality. Home care services were systematically contacted to collect data on formal help received at home prior to hospitalization. In addition, in-hospital BADL performance was obtained from the ward nurse in charge of the patient. Main admission diagnosis, Charlson comorbidity index (38) and data on medication prescribed at home were collected from the medical records. Information about length of stay and destination after discharge were collected from the administrative files.

### *Assessment and recognition of depressed mood*

To define depressed mood, we used the commonly recommended GDS cut-off of 6 or more depressive symptoms, which has been shown in previous studies to have a sensitivity ranging from 85 to 88%, with specificity of 62 to 71% (35, 39, 40). Although a score of 6 is not equivalent to major depression, it implies a depressive symptomatology

significant enough to justify further evaluation for depression.

To assess the recognition of depressed mood, a separate reviewer, blinded to the GDS results, performed a discharge summary review. Depressed mood was considered recognized if either mentioned in the discharge diagnoses, in the discussion section of the discharge summary, or if an antidepressant was prescribed at discharge. Low dose amitriptyline prescribed for painful chronic neuropathy (e.g., diabetic, post-zoster) was not considered as an antidepressant treatment unless specified in other parts of the discharge summary. To maximize sensitivity of our definition of a recognized case, we also included subjects with a prescription for daytime benzodiazepines at discharge (i.e., not prescribed only as a sleeping pill). Although benzodiazepines are not considered an appropriate treatment for depression, they are sometimes prescribed for this condition (41). Reliability of recognition assessment was tested in a random sample of 50 discharge summaries abstract-

ed by a second reviewer, blinded to the first reviewer's and GDS's results. Inter-rater agreement was 94% (kappa=0.74,  $p < 0.001$ ).

### Statistical analysis

The characteristics of subjects with and without depressed mood were first compared in bivariate analysis using  $\chi^2$  or Fischer's exact tests, depending on the distribution, for categorical variables. Student's *t*-test was used for continuous variables. A stepwise multivariate logistic regression analysis was performed to identify baseline characteristics independently associated with the presence of depressed mood. To be included in the multivariate model, variables had to show a statistically significant association in bivariate analysis. Because some variables were highly correlated (e.g., pre-admission BADL and IADL, admission BADL, and MMSE), we decided *a priori* to preferentially include in the initial model variables that resulted from objective rather than self-report measures (e.g., nurse-observed

Table 1 - Baseline characteristics of the total population and bivariate comparisons in patients with and without a depressed mood (defined as a GDS score  $\geq 6$ ).

		Total population	Depressed mood		<i>p</i> *
		(N=401)	Yes (N=90)	No (N=311)	
Age (mean $\pm$ SD)	(years)	82.4 ( $\pm 5.0$ )	83.5 ( $\pm 5.0$ )	82.0 ( $\pm 5.0$ )	0.014
Women	(%)	60.9	61.1	60.8	0.954
Living alone	(%)	57.6	66.7	55.0	0.048
High school education	(%)	54.1	48.9	55.6	0.259
Comfortable self-rated income	(%)	61.9	52.2	64.6	0.033
Going out of home <1 time/week	(%)	23.4	42.2	18.0	<0.001
In-home help prior to hospitalization					
- Informal (i.e., family)	(%)	45.1	47.8	44.4	0.568
- Formal (i.e., in-home services)	(%)	44.1	60.0	39.6	0.001
Major admitting diagnosis:					
- Falls/ Malaise/Failure to thrive	(%)	20.0	26.7	18.0	0.070
- Cardiovascular disease	(%)	39.4	40.8	34.4	0.274
- Pulmonary disease	(%)	13.0	11.1	13.5	0.552
Charlson index score (mean $\pm$ SD)	(mean)	1.3 ( $\pm 1.4$ )	1.6 ( $\pm 1.9$ )	1.2 ( $\pm 1.3$ )	0.007
Polypharmacy (>4 drugs)	(%)	41.4	46.7	39.9	0.249
BADL score prior to admission §	(mean)	5.4 ( $\pm 0.9$ )	5.2 ( $\pm 1.1$ )	5.5 ( $\pm 0.8$ )	0.001
IADL score prior to admission #	(mean)	4.9 ( $\pm 2.2$ )	4.1 ( $\pm 2.2$ )	5.1 ( $\pm 2.1$ )	<0.001
BADL score at admission	(mean)	3.9 ( $\pm 1.7$ )	3.2 ( $\pm 1.7$ )	4.1 ( $\pm 1.7$ )	<0.001
Abnormal MMSE ¶	(%)	32.2	47.8	27.7	<0.001

\* Chi-square test (categorical variables) or Student's *t*-test (continuous variables) comparing patients with and without depressed mood.

§ Self-rated income on a 5-point Likert scale (no financial difficulties at all to many difficulties).

¶ Charlson comorbidity index (38).

§ BADL: Basic Activities of Daily Living. Including bathing, dressing, using the toilet, transferring between bed and chair, maintaining continence, feeding. Scores range from 0 to 6, with higher scores indicating higher function (33).

# IADL: Instrumental Activities of Daily Living. Including using the phone, grocery shopping, cooking, housekeeping, doing the laundry, using transportation, taking medications, handling finances. Scores range from 0 to 8, with higher scores indicating higher function (34).

¶ MMSE: Mini Mental Status Exam. Score ranging from 0 to 30, with scores below 24 suggesting the presence of cognitive impairment (35).

BADL performance at admission rather than self-reported BADL prior to hospitalization). The significance levels to enter and to remain in the model were set at 0.2 and 0.3, respectively. Statistical analyses were performed using Stata 6.0 (Stata Corp, College Station, TX).

## RESULTS

Baseline characteristics of the entire study population are shown in the first column of Table 1. The typical subject was an 82.4 years old woman, living alone, with a high school education, who rated her income as comfortable. The most frequent admitting diagnoses were cardiovascular disorders (39.4%), while falls, malaise, and failure to thrive accounted for 20.0% of the admissions. At the time of admission, more than two thirds had at least one comorbidity, and about 13% had three or more (Charlson index). Self-perceived health was rated fair or poor by 52.1% of patients. While the mean number of prescription drugs was 4.5 (range 0 to 20), 5% of the patients were not taking any medication. Dependency in one or more BADL and IADL was reported by 38.9% and 86.3% of the population, respectively. Abnormal GDS ( $\geq 6$ ) and MMSE ( $<24$ ) scores were observed in 22.4% and 32.2% of the patients, respectively. Distribution of the GDS score in the study population is shown in Figure 1.

The median length of stay was 8.0 days (mean: 10.3, range: 1-100). Overall, 20 patients (5.0%) died during their hospital stay.

In bivariate analysis (Table 1), patients with a depressed mood were older and more frequently living alone. They infrequently left their home, and received

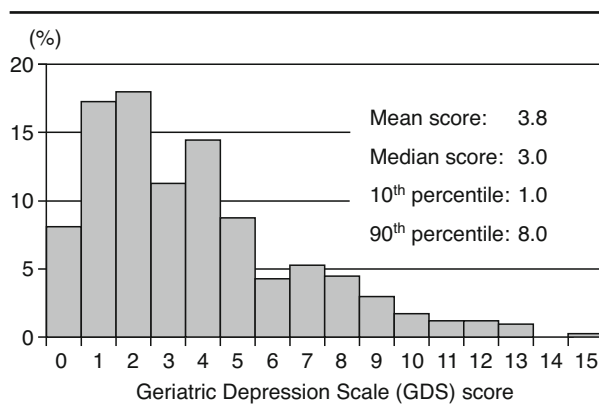


Figure 1 - Distribution of Geriatric Depression Scale (GDS) scores in the study population.

formal help by in-home care services more often. Admitting diagnoses of falls, malaise and failure to thrive tended to be more frequent in patients with depressed mood. In addition, the amount of comorbidity was higher for patients with depressed mood, who were also more impaired in basic and instrumental ADL before hospitalization, and in basic ADL at admission. In addition, they more frequently had an abnormal MMSE score ( $<24$ ).

In multivariate analysis (Table 2), an independent association with the presence of a depressed mood remained for patients living alone, and those with an abnormal MMSE score. These patients were 1.8 times and 1.9 times, respectively, more likely to have depressed mood. The likelihood of having a depressed mood also increased with an increase in comorbidity using the Charlson index. Several variables that were significantly associated with the presence of depressed mood in bivariate analysis, such as pre-admission functional status and mobility, did not remain in the model after controlling for admission BADL and MMSE status. Similarly, formal help received prior to hospital admission did not remain in the model after controlling for the living situation (living alone). Overall, the model performed better than chance in discriminating patients with and without depression (area under the ROC curve of 0.68), but its clinical usefulness is obviously limited by the amount and type of data required (e.g., MMSE, Charlson index), when compared to GDS administration. Moreover, based on this model, we attempted to stratify the population according to the presence of 0, 1, and 2 or 3 risk factors for depression (i.e., living alone, having an abnormal MMSE, and having one or more comorbidities). The resulting groups had only 9.2%, 19.3% and 32.9% of the subjects with depressed mood. Thus, even in the highest risk group defined by this model, two thirds of the subjects did not report depressed mood by GDS.

Results of sensitivity analyses using higher GDS cut-off scores to define depressed mood are shown in Table 2. Results were not substantially modified except for the living situation variable (living alone), which did not remain in the model when using a GDS cut-off of 10 or more as the dependent variable. This is likely due to the too small number ( $N=22$ ) of subjects with an abnormal GDS in this subgroup analysis.

In addition, because severe cognitive impairment has been shown to alter psychometric properties of the GDS, we repeated the analysis after excluding 30 subjects with MMSE scores lower than 16. Results were unchanged (Table 2).

Table 2 - Results of the multivariate analyses predicting the presence of depressed mood.

Characteristics	Analysis with the entire population, using different GDS cut-off scores to define depressed mood (N=401)						Analysis excluding subjects with MMSE score <16 (N=371)	
	GDS cut-off score ≥6		GDS cut-off score ≥8		GDS cut-off score ≥10		Adj OR * (95% CI)	p
	Adj OR * (95% CI)	p	Adj OR (95% CI)	p	Adj OR (95% CI)	p		
Living alone	1.8 (1.1-3.0)	0.030	2.0 (1.0-3.8)	0.041	-	-	1.8 (1.0-3.1)	0.039
Charlson comorbidity index	1.3 (1.1-1.5)	0.004	1.2 (1.0-1.4)	0.107	1.3 (1.1-1.7)	0.015	1.3 (1.1-1.5)	0.005
Abnormal MMSE score	1.9 (1.1-3.2)	0.021	2.6 (1.5-4.8)	0.001	3.2 (1.3-7.7)	0.010	1.8 (1.0-3.2)	0.050

\* Odds ratio adjusted for age and BADL status in addition to above variables.

### Detection rate

Among the 90 patients with a GDS score of 6 or more, only 15 (16.7%) were identified according to the discharge summary review. Only two of these 15 cases were considered detected because of benzodiazepine prescription. Using higher GDS score cut-offs improved the detection rate only marginally. Cut-off scores of 8 or more, and 10 or more resulted in detection rates of 19.2% and 22.7%, respectively.

### DISCUSSION

Our results confirm the high prevalence, and the poor recognition rate of depressed mood in older hospitalized persons. The recognition rate found in our study (16.7%) is comparable to other studies (2, 26, 27). Several explanations have been proposed to explain the difficulties in diagnosing depressive problems in this population, such as precedence of acute medical illness, atypical presentation of depression, interaction with multiple comorbidities, or even the assumed normal sadness of elderly persons who are hospitalized. To improve the detection rate, systematic testing with screening instruments such as the GDS have been proposed, but time constraints limit their routine use. Although the GDS has been used as a self-assessment instrument, this strategy seems difficult to implement in an acute care setting.

From this perspective, characteristics associated with a depressed mood in this study could theoretically be used to better target screening efforts. Our results confirm findings of other studies in which

both social (living alone) and medical (comorbidity) characteristics have been associated with depressed mood, while age and gender were not (2, 27, 29). In contrast, our findings differ from those of previous studies in hospitalized elderly which found no relationship between depression and an abnormal MMSE (2, 29). This difference may be explained, in part, by differences in population selection and size, setting, and diagnostic criterion used. However, a significant association between depression and cognitive impairment has been described in community-dwelling elderly (28). Complex interactions between depression and cognitive impairment are well documented (42), and thus not surprising.

Despite the positive finding showing an association between depressed mood and several patient characteristics, using these characteristics to enhance detection is unlikely to be successful because of the weakness of the observed statistical associations. Therefore, use of a single pre-screening question, as proposed in the office setting (43), or of the recently tested five-item version of the GDS (40) is probably a promising strategy to enhance recognition of depressed mood in the hospitalized elderly. Further studies are needed to test this approach.

Several limitations of this study need to be mentioned. First, we used a screening instrument (GDS) instead of a structured diagnostic tool as a criterion standard for the diagnosis of depressed mood. To acknowledge this limitation, we used the term depressed mood rather than depression in this study. However, several studies have shown that depressed mood (using similar GDS cut-off) or subsyndromal depression were associated with significant

functional disability and morbidity (7-9, 18). In addition, preliminary results suggest that treatment of subsyndromal depression might benefit patients (44). Second, we used cross-sectional data, and we cannot specify the causal relationship between depressed mood and patient characteristics. Third, the use of the discharge summary to evaluate recognition can also be criticized. Abstracts of the medical records may have given more complete information on the problems addressed during the hospitalization, including depressed mood. However, the discharge summary is the main, and frequently the only written document received by the primary care physician, and should contain all relevant information to be transmitted. The absence of any mention of a depressive problem is likely to result in further delay in its recognition and treatment by the primary care physician. Finally, the very small number of recognized cases made it impossible to achieve further insight into the patient characteristics associated with poor recognition.

Despite these limitations, this study highlights the continuous need for improving the recognition and treatment of depressed mood in hospitalized elderly persons. It must be emphasized that recognition is a necessary but not the only step in the management of depressed elderly patients. Teaching programs for physicians and other professionals that stress the importance of considering and treating depressive problems in elderly patients are equally important to achieve better results (45). The observed associations between depressed mood, functional decline, increased morbidity and mortality suggest that improved recognition and treatment have the potential for improving the overall outcomes and quality of life of these patients.

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