## Hospitalization in Community-Dwelling Persons with Alzheimer's Disease: Frequency and Criteria

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# **Clinical Bottom Line:**

In a community dwelling population with mild Alzheimer's Disease, hospitalization is frequent in participants over a median follow-up time of 3 years with potential risk factors for hospitalization determined to be age, comorbidity, prior hospitalizations, male sex and shorter duration of symptoms.

# Introduction:

Alzheimer's disease (AD) is a devastating, progressive neurodegenerative disease currently without a known curative treatment. Healthcare costs for AD make it the third most costly disease, with hospital costs being 2.8 times higher in patients with AD than age-matched Medicare beneficiaries. Hospitalization may represent a pivotal point for patients with AD that often results in loss of independence or other unfortunate outcomes. Prior studies show that hospital outcomes with patients with AD are significantly worse than in patients without AD but these studies have not explored the risk factors predisposing patients to hospitalization.

**Objectives**: To examine the rates of and risk factors for acute hospitalization in a prospective cohort of older community-dwelling patients with Alzheimer's disease (AD).

**Source of Funding**: American Federal for Aging Research, National Institute on Aging, Alzheimer's Association, Aging Brain Center, Institute for Aging Research, Hebrew Senior Life

**Study Design:** Participants were drawn from a cohort of consecutive patients assembled by the MADRC Patient Registry enrolled from January 1, 1991 to June 30. 2006. Patients were 65 or older with a clinical diagnosis of probable or possible AD established by the examining neurologist with 3 or greater follow up visits with the MADRC. Patients received an initial assessment in MADRC that included a medical history, neurological examination and cognitive testing with dementia severity rating. Follow up assessments were completed every 6 months. Major categories of potential risk factors for hospitalization were examined (sociodemographic, dementia related, acute illness related) using specific cutpoints to determine associations among these variables and hospitalization.

**Interventions:** None described within the study though presumably the patients' physicians were providing interventions to prevent hospitalization

Participants: Eight hundred twenty-seven older persons with Alzheimer's Disease

**Inclusion Criteria:** Age 65 and older with a clinical diagnosis of probable or possible AD as diagnosed by a neurologist based on the National Institute of Neurological and Communicable Diseases and Stroke/Alzheimer's Disease and Related Disorders with 3 or more visits with the MADRC who signed consent for use of their clinical data for research purposes.

**Exclusion Criteria:** Patients younger than 65, patients with fewer than 3 visits with MADRC, patients enrolled in a Medicare health maintenance organization, patients who refused to sign consent for use of their clinical data for research purposes.

**Primary Outcome Measure**: First acute hospitalization after the index visit at MADRC

**Secondary Outcome Measures:** Potential risk factor variables including: education level (< or >12 years), BIMC score, speed and course of onset of AD and symptoms, severity of AD staged using MADRC Dementia Severity Rating scale, course of symptoms (fluctuating or stepwise), previous hospitalizations, Deyo-Charlson index, admitting diagnosis to the hospital.

**Analysis:** To examine risk factor variables (for hospitalization), bivariable analyses were conducted using unadjusted Cox proportional hazards models, with time to index hospitalization as the dependent variable (this was defined as years from index MADRC visit to index hospitalization visit for all subjects, including those were not hospitalized). Multivariable proportional hazards models were conducted adjusting for risk factor variables. The Schoenfeld global test was conducted to test the proportionality assumption while the Gompertz model was used to confirm the results of the Cox models. Regression coefficients were estimated using maximum likelihood method to yield estimated hazard ratios with 95% confidence intervals. All statistical tests were two-tailed, and an alpha level of less than .05 was used to indicate statistical significance. Additionally, risk stratification was assigned by adding 1 point for each risk factor present in all subjects. A chi-sqaure test was used to examine the incidence of hospitalization across strata.

**Results:** Of the 827 eligible patients seen at the ADRC during 1991 to 2006 (median follow up 3.0 years), 542 (66%) were hospitalized at least once, and 389 (47%) were hospitalized two or more times, with a median of 3 days spent in the hospital per person-year. Leading reasons for admission were syncope or falls (26%), ischemic heart disease (17%), gastrointestinal disease (9%), pneumonia (6%), and delirium (5%). Five significant independent risk factors for hospitalization were higher comorbidity (hazard ratio (HR) = 1.87, 95% confidence interval (CI) = 1.57-2.23), previous acute hospitalization (HR=1.65, 95% CI = 1.37-1.99), older age (HR = 1.27, 95% CI = 1.04-1.54), and shorter duration of dementia symptoms (HR = 1.26, 95% CI=1.02-1.56). Cumulative risk of hospitalization increased with number of

risk factors present at baseline: 38% with zero factors, 57% with one factor, 70% with two or three factors, and 85% with four or five factors (Ptrend <.001).

## Adverse Events: None described

#### Limitations:

- 1. Unable to fully assess acute indications for hospitalization from the MADRC assessments and Medicare Data
- 2. Prior hospitalization records were not available for the initial year of the study (1991).
- 3. Needed further assessment at the index MADRC of the relationship between speed of cognitive decline and recent delirium.
- 4. Exclusion of patients with fewer than three MADRC visits may have limited generalizability of this study.
- 5. Minority representation in this sample is low.
- 6. The data was drawn from a single site