

Letters

RESEARCH LETTER

Survival After Multiple Hospitalizations for Infections and Dehydration in Nursing Home Residents With Advanced Cognitive Impairment

Multiple hospitalizations for complications from a terminal illness may be burdensome for elderly patients and reflect poor quality care. Infections and eating problems are 2 such complications characterizing the final stage of dementia.¹

In a previous study,¹ burdensome health care transitions were defined as 2 or more hospitalizations for infections or dehydration during the last 90 days of life in nursing home (NH) residents with advanced cognitive impairment. The objective of this study was to examine a related issue: whether the occurrence of multiple hospitalizations for these complications was associated with survival.

Methods | The study population was identified using data from the national Minimum Data Set repository,² which includes standardized assessments regularly completed by staff on all NH residents in the United States between January 1, 2000, and December 31, 2008. We identified the first baseline assessment in which a resident had a Cognitive Performance Score³ of 4, 5, or 6, indicating moderate to very severe cognitive impairment.

We excluded residents who did not survive 30 days beyond the date of this baseline assessment. We followed up the remaining residents for 1 year from the baseline assessment date (through 2009) and identified those who had 2 or more hospitalizations for the same type of the following diagnoses: pneumonia, urinary tract infection (UTI), septicemia, or dehydration or malnutrition. Hospitalizations for these con-

ditions were ascertained from Medicare inpatient claims and based on *International Classification of Diseases, Ninth Revision* codes.

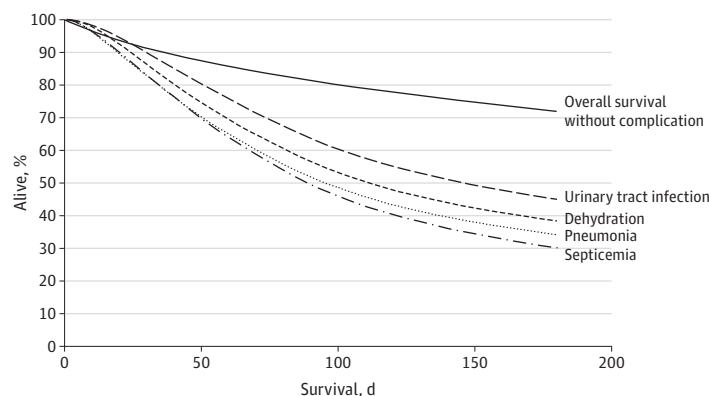
Cox proportional hazards models were used to describe survival for the residents who had multiple hospitalizations based on the discharge date of the first (index) hospitalization. For comparison, we generated a survival curve in the absence of these complications using a competing risk model. This model examines the overall survival of NH residents accounting for the contributions of persons with 2 or more of these complications to overall survival up to the point of the second complication, when they are censored.

Median survival time was based on these risk-adjusted models for age, sex, race/ethnicity, Cognitive Performance Score, activities of daily living score, the Changes in Health, End-stage disease, Symptoms and Signs scale score,⁴ and the presence of a do-not-resuscitate order. Race/ethnicity was based on the Minimum Data Set assessment. The institutional review board at Brown University approved this research with waiver of consent. Analyses were performed using Stata version 12 (StataCorp).⁵

Results | Between 2000 and 2008, 1.3 million NH residents (mean [SD] age, 84.5 [7.5] years; 71.2% were female; 10.2% were black) attained a Cognitive Performance Score of 4, 5, or 6 and survived at least 30 days after that assessment. During the course of 1 year, there were 2 or more hospitalizations for pneumonia in 1.78% (95% CI, 1.76%-1.81%); UTI in 4.33% (95% CI, 4.29%-4.37%); septicemia in 1.58% (95% CI, 1.54%-1.58%); and dehydration in 3.49% (95% CI, 3.45%-3.52%).

The **Figure** presents the adjusted 180-day survival for those with 2 or more complications that define a burdensome transition. Compared with overall survival (476 [95% CI, 475-478]

Figure. Adjusted 180-Day Survival of 1.3 Million Nursing Home Residents With Advanced Cognitive Impairment With 2 or More Hospitalizations for Selected Complications



This adjusted 180-day survival curve is based on a competing risk model in nursing home residents with advanced cognitive impairment who experienced 2 or more hospitalizations for selected complications vs overall survival for those without complications. For nursing home residents with 2 or more of these complications, survival time was included up to the point of the second complication.

days), the adjusted survival was significantly lower for all of the burdensome transitions: pneumonia, 95 (95% CI, 93-97) days; UTI, 146 (95% CI, 143-148) days; dehydration or malnutrition, 111 (95% CI, 109-113) days; and septicemia, 89 (95% CI, 87-90) days.

Discussion | Nursing home residents with advanced cognitive impairment who underwent multiple hospitalizations for the same infections or dehydration had poor survival. Prior research suggests that these common complications of dementia can be treated with the same efficacy in the NH.⁶ Future research is needed to understand whether these transitions are based on financial incentives, poor communication, or a lack of resources needed to diagnose and treat a NH resident.

We relied on administrative billing data to ascertain that NH residents were hospitalized for these complications. Despite this limitation, the observed survival suggests that the first hospitalization with these diagnoses for NH residents with advanced cognitive impairment should result in reconsideration of the goals of care and the appropriateness of continued hospitalizations.

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Author Contributions: Dr Teno had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Acquisition of data: Teno, Mor.

Analysis and interpretation of data: Teno, Gozalo, Mitchell, Mor.

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COMMENT & RESPONSE

Long-term Follow-up of Young Adults With Stroke

To the Editor Mr Rutten-Jacobs and colleagues¹ reported the long-term follow-up of 959 young adults with stroke and observed a standardized mortality ratio of 4.3 for women and 3.6 for men. The authors also registered clinical severity and disability using the National Institutes of Health Stroke Scale and modified Rankin scale. It would be interesting to assess the association between these parameters and mortality rate during follow-up because previous studies have demonstrated a poor long-term prognosis in patients with stroke and a high level of disability at discharge.²

Another concern involves specific and rare vascular risk factors. In young patients with stroke, classic vascular risk factors such as hypertension or diabetes are less frequent. Could the authors analyze what specific types of risk factors were present in the 34.5% of the sample without classic vascular risk factors at baseline?

Anatomical anomalies (ie, patent foramen ovale), arterial pathological conditions (ie, dissections), or genetic polymorphisms could contribute to stroke risk in these young patients. Evidence of genetic determinants of mortality and incidence of major diseases, such as coronary artery disease, stroke, and transient ischemic attack, have recently been demonstrated.³

Young people with cerebrovascular disease may be prone to have another vascular event. As previously reported,⁴ secondary prevention after an accurate etiological diagnosis of the event is necessary to ensure risk reduction, with regular clinical follow-up and high adherence to treatment.

To better assess the effects of modifying cardiovascular risk factors on incidence and mortality, some computer simulation models have been validated.⁵ Personalization of preventive strategies is fundamental for each patient, especially young patients with stroke.

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