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Featured Article

The financial burden and health care utilization patterns associated with amnestic mild cognitive impairment

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Abstract

Introduction: Individuals with amnestic mild cognitive impairment (aMCI) are at elevated risk of developing Alzheimer's disease (AD) dementia.
Methods: With data from the Aging, Demographics, and Memory Study, we used the Clinical Dementia Rating Sum of Boxes classifications to conduct a cross-sectional analysis assessing the relationship between cognitive state and various direct and indirect costs and health care utilization patterns.
Results: Patients with aMCI had less medical expenditures than patients with moderate and severe AD dementia ($P < .001$) and were also significantly less likely to have been hospitalized ($P = .04$) and admitted to nursing home ($P < .001$). Compared to individuals with normal cognition, patients with aMCI had significantly less household income ($P = .018$).
Discussion: Patients with aMCI had lower medical expenditures than patients with AD dementia. Poor cognitive status was linearly associated with lower household income, higher medical expenditures, higher likelihood of nursing and home care services, and lower likelihood of outpatient visits.

Keywords: Mild cognitive impairment; Cognitive status; Costs; Cost analysis; Financial burden

1. Introduction

Those diagnosed with mild cognitive impairment (MCI) are at elevated risk of developing Alzheimer's disease (AD) dementia, which represents the most common cause of age-related dementia and affects nearly 44 million people worldwide [1–4]. Although there exists a considerable body of research on the socioeconomic burden associated with dementia due to AD, there are far fewer published studies assessing the costs associated with amnestic MCI (aMCI). As new diagnostics and treatment modalities specifically targeting aMCI leading to AD dementia emerge, isolating aMCI and AD dementia is imperative to an accurate assessment and characterization of the economic impact that new clinical interventions may have.

Until recently, the lack of well-defined clinical criteria to distinguish and characterize normal aging from MCI, and MCI from more severe forms of dementia [5] has made it difficult to precisely identify the monetary costs attributable to MCI. Several studies, though, have sought to project and characterize the monetary costs associated with dementia from any cause using data from the Aging, Demographics, and Memory Study (ADAMS), a nationally representative population-based study of cognitive status drawn from the larger Health and Retirement Study (HRS) [6,7]. Hurd et al. found that the financial burden of dementia on society is comparable to that of heart disease and cancer [8]; however, it should be noted that in this analysis, the authors neither differentiate dementia from AD dementia nor aMCI from MCI due to other

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causes. Using microsimulation models to estimate future prevalence and costs, Zissimopoulos et al. found that interventions delaying the onset of AD by 5 years would result in projected reductions of 41% lower prevalence and 40% lower costs associated with AD [9]. However, this study did not differentiate a MCI from other forms of MCI or from cognitively normal individuals. In a retrospective analysis of HRS data, Kelly et al. found that total health care spending of Medicare beneficiaries with probable dementia form any cause in the last 5 years of life was significantly greater than that of non-dementia groups [10]. Finally, in a population-based cross-sectional study of patients within Olmsted County, Minnesota, Leibson et al. found that mean direct annual costs estimates for individuals with prevalent dementia due to any cause was nearly twice those for cognitively normal individuals [11].

The economic impact to individuals living with dementia and to family members and caregivers of patients diagnosed with dementia is well documented [12–14]. However, little is known about how aMCI impacts individuals diagnosed with the disease. Toward that end, this study seeks to add to the literature on the various costs and health care utilization patterns of these patients in comparison to cognitively normal and patients diagnosed with AD.

2. Methods

2.1. Study design

Using data from the 2002 wave of the ADAMS, a nationally representative study of dementia in the United States [15], we conducted a cross-sectional analysis assessing the association between cognitive status and total direct medical (out-of-pocket and insurance) and indirect (household income) costs borne by participants and their spouses. We also assessed patterns of health care utilization.

2.2. Data source and sample

The HRS is an ongoing biennial longitudinal survey of a nationally representative cohort of more than 20,000 adults in the United States [16]. The ADAMS is a substudy of the HRS focused on identifying the prevalence of and outcomes associated with cognitive impairment and dementia [7,17]. Participants from the larger HRS study were considered for the ADAMS sample based on scores from the HRS cognitive scale or from other assessments of cognition. The ADAMS study population (n = 856) comprised of men and women, who were US residents living in the community or in long-term care facilities and aged 70 years and older, all at the time of assessment.

Participants were assessed for cognitive impairment and dementia using an in-home battery of neuropsychological tests administered by a nurse and neuropsychology technician, both trained and supervised by PhD level neuropsychologists [7,15]. Neuropsychological measures were used to distinguish normal cognitive function from cognitive impairment but no dementia (CIND; for the purposes of this study, we use the terms "MCI" and "CIND" interchangeably) and from dementia. Information collected during the assessments, along with relevant medical records, were reviewed by a consensus panel that assigned a final diagnoses accompanied with an etiology [7].

2.3. Classification of AD diagnosis and cognitive status in present study

2.3.1. Classification of AD diagnosis

We leveraged the consensus panel diagnosis of cognitive status (normal, CIND, dementia) and etiology to select our sample. Individuals with a diagnosis of CIND due to vascular, psychiatric, mental/developmental, drug-induced, and other medical etiologies were excluded from the study sample. We classified all other individuals with a diagnosis of CIND as having aMCI (n = 121). These individuals had an assigned etiology of either amnestic or unknown. Those assigned a probable or possible AD diagnosis by the consensus panel were classified as the AD population (n = 174). Any individuals diagnosed with dementia due to vascular etiologies, Parkinson's disease, Lewy Body disease, Huntington's disease, head trauma, neuropsychological hydrocephaly, or progressive supranuclear palsy were excluded. The analytic sample consisted of 316 cognitively normal individuals, 121 with aMCI, and 174 with AD.

2.3.2. Classification of cognitive status

The Clinical Dementia Rating Sum of Boxes (CDR-SB) to further classify severity of disease among subjects was used in our analytic sample. Although the Clinical Dementia Rating Global Score (CDR) is regularly used in clinical settings for dementia, the value of CDR in staging MCI has been called into question [18]. In contrast, the CDR-SB has been found to offer several advantages over the CDR, including simpler calculation, increased precision in staging of disease, and an ability to detect the subtle changes associated with milder forms of cognitive impairment. Thus, CDR-SB is considered particularly useful for distinguishing patients with MCI versus those diagnosed with early AD [18,19].

We categorized all individuals in our analytic sample according to a more granular severity scale, namely the CDR-SB (normal, 0; mild cognitive impairment, 0.5–4.0; mild dementia, 4.5–9.0; moderate dementia, 9.5–15.5; severe dementia, 16+) [20]. Those with a CDR-SB score of 0.5–4.0 were considered to have aMCI. As a secondary analysis, we classified our sample according to the CDR Global Score, which divides AD into three degrees of severity: mild dementia, 1; moderate dementia, 2; severe dementia, 3+.