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Direct medical costs and source of cost differences across the spectrum of cognitive decline: A population-based study

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Abstract

Background: Objective cost estimates and source of cost differences are needed across the spectrum of cognition, including cognitively normal (CN), mild cognitive impairment (MCI), newly discovered dementia, and prevalent dementia.

Methods: Subjects were a subset of the Mayo Clinic Study of Aging stratified-random sampling of Olmsted County, MN, residents aged 70 to 89 years. A neurologist reviewed provider-linked medical records to identify prevalent dementia (review date = index). Remaining subjects were invited to participate in prospective clinical/neuropsychological assessments; participants were categorized as CN, MCI, or newly discovered dementia (assessment date = index). Costs for medical services/procedures 1-year pre-index (excluding indirect and long-term care costs) were estimated using line-item provider-linked administrative data. We estimated contributions of care-delivery site and comorbid conditions (including and excluding neuropsychiatric diagnoses) to between-category cost differences.

Results: Annual mean medical costs for CN, MCI, newly discovered dementia, and prevalent dementia were $6042, $6784, $9431, $11,678, respectively. Hospital inpatient costs contributed 70% of total costs for prevalent dementia and accounted for differences between CN and both prevalent and newly discovered dementia. Ambulatory costs accounted for differences between CN and MCI. Age-, sex-, education-adjusted differences reached significance for CN versus newly discovered and prevalent dementia and for MCI versus prevalent dementia. After considering all comorbid diagnoses, between-category differences were reduced (e.g., prevalent dementia minus MCI (from $4842 to $3575); newly discovered dementia minus CN (from $3578 to $711)). Following the exclusion of neuropsychiatric diagnoses from comorbidity adjustment, between-category differences tended to revert to greater differences.

Conclusions: Cost estimates did not differ significantly between CN and MCI. Substantial differences between MCI and prevalent dementia reflected high inpatient costs for dementia and appear partly related to co-occurring mental disorders. Such comparisons can help inform models aimed at identifying where, when, and for which individuals proposed interventions might be cost-effective.

Keywords: Dementia; Cognitive status; Mild cognitive impairment; Economics; Utilization; Cost

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1. Introduction

The burden of Alzheimer's disease (AD) and related dementias on affected individuals, families, health care providers, and society is substantial and growing, both in the United States and elsewhere [1,2]. As life expectancy increases and the "Baby Boom" generation ages, the estimated five million Americans with AD in 2012 is projected to nearly triple to 14 million by 2050 [3]. Total payments for health care, long-term care, and hospice for AD and other dementias in the United States are projected to increase sixfold from 214 billion dollars in 2014 to 1.2 trillion dollars in 2050 [3]. These projections are especially alarming because existing pharmacological efforts to prevent dementia onset, slow its progression, or mitigate its impact have been largely disappointing.

In response to the impending crisis, a National Alzheimer's Project Act was signed into law in 2011 and the National Plan to Address Alzheimer's Disease was released in May 2012 [4]. The first goal of the National Plan is to find effective ways to prevent and treat AD and other dementias. Reliable estimates of costs associated with cognitive decline will be needed to determine the net cost and/or cost-effectiveness of alternative therapies.

Of existing models constructed to evaluate the economics of dementia prevention, postponement, or treatment [5–15], few appear to have had simultaneous access to two key elements: detailed objective data on costs and accurate assignment of cognitive status. Objective and complete estimates of direct medical costs can be obtained from billing data. However, reliance on diagnosis codes from billing data to identify dementia has serious limitations, and important biases have been demonstrated [16–18].

Of those studies in which dementia was carefully assessed, the vast majority have estimated medical costs based solely on self- or proxy-report of utilization (e.g., number of hospitalizations, hospital days, Emergency Department [ED] visits, office visits) followed by application of average costs per unit obtained for the general population. Such cost estimates may be limited by recall bias and fail to consider higher unit costs for cognitively impaired individuals compared with unimpaired individuals with the same medical conditions [3,19–21]. The few exceptions with access to objective cost estimates using administrative data [22,23] have typically been limited to fee-for-service Medicare data, thus missing non-Medicare costs and those for the nearly 30% of Medicare managed care enrollees [24].

Regardless of across-study differences and limitations, the devastating economic consequences of Alzheimer's disease and other dementias are observed for both direct (including medical and nursing home care) and indirect (informal) care. There is general agreement that mean direct medical cost differences between persons with and without dementia are greatest for hospital inpatient use and that comorbidity plays an important role. However, a majority of studies of comorbidity costs have been limited to a few self-reported conditions or medications. More objective data on a broader range of conditions are needed to inform where excess costs for individuals with dementia might be reduced.

There is less appreciation for the extent and source of excess medical costs associated with cognitive impairment that does not meet criteria for dementia. Depending on the question being addressed and where interventions may have the greatest impact, there is a need for estimates of costs across the spectrum of cognition, including the ability to distinguish cognitively normal individuals from those meeting criteria for mild cognitive impairment (MCI) and from those meeting criteria for previously undiagnosed dementia [25–27]. The difficulties noted above for assigning both cognitive status and objective cost estimates for dementia are magnified for these earlier stages. Of three reports estimating MCI-associated costs separately [28–30], MCI cognitive status was determined using currently accepted criteria [31,32] in two [28,29]. One of the two was drawn from clinical trials, with MCI cases referred for informant-identified memory complaints [28]. Both were limited to comparisons between individuals with and without MCI and thus excluded comparisons that may be relevant for conversion from MCI to dementia. None of the three previous studies had access to objective cost estimates.

This study seeks to add to our understanding of direct medical costs (excluding long-term care costs) across the spectrum of cognitive decline by employing three unique population-based resources: (a) a medical records-linkage infrastructure system that includes detailed clinical data for essentially all residents of Olmsted County, MN [33,34]; (b) a prospective cohort study consisting of randomly sampled Olmsted County residents age 70 to 89 years who were assessed for cognitive status using neurologic evaluation and neuropsychological testing [35]; and (c) provider-linked billing data consisting of line-item detail that affords direct cost estimates for essentially all medical services and procedures received by County residents (excluding long-term care) [36]. These resources provide a rare opportunity to compare direct medical costs for individuals categorized as cognitively normal (hereafter referred to as CN), MCI, newly discovered dementia, and prevalent dementia. The present study also investigates factors associated with between-category cost differences. Findings will help address the recognized need to inform future projections regarding which interventions might be most cost-effective for which individuals, in which settings, and at which stage of cognitive decline [25,37].

2. Methods

2.1. Design/setting/resources

2.1.1. Rochester Epidemiology Project

This population-based cross-sectional study was conducted in Olmsted County, MN. The capability for