Nationwide Healthcare Expenditures among Hypertensive Individuals with Stroke: 2003-2014

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Background: Of all the various clinical entities, hypertension is arguably most strongly linked to the occurrence of stroke. However, the impact of stroke on health-care expenditures in patients with hypertension has not been previously evaluated. *Methods:* We analyzed data from the Medical Expenditure Panel Survey Household Component, 2003-2014 data. Adults aged 18 years or greater were included in this analysis. We used a 2-part model (adjusting for demographic, comorbidity, and time) to estimate the incremental health-care expenditures incurred by stroke among individuals with hypertension. *Results:* On average, $4057 more dollars (adjusted incremental health-care expenditure) was spent on individuals with hypertension plus stroke versus no history of stroke. Overall unadjusted mean medical expenditure in those with a comorbid diagnosis of stroke was twice as high as in those without a diagnosis of stroke ($16,668 versus 8374; $P < .001$). Inpatient expenditures (37.4%), outpatient expenditures, and prescription expenditures (nearly 23% each) accounted for almost 80% of the total mean unadjusted direct expenditures. Annual average unadjusted aggregate costs among individuals with hypertension and stroke were $98.3 billion, while annual adjusted aggregate incremental costs were higher by $24 billion among patients with stroke versus those without stroke. *Conclusion:* Among individuals with hypertension in the United States, those who have experienced a stroke incur tens of billions of dollars in higher health-care expenditures compared with those without known stroke. Greater emphasis on stroke prevention strategies and cost control initiatives (wherever appropriate) are warranted. **Key Words:** Hypertension—stroke—health-care expenditure—nonstroke—nationwide.

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Introduction

Despite recent therapeutic advances that have contributed to shifting stroke from the third to the fifth cause of mortality in the United States behind diseases of the heart, cancer, chronic lower respiratory diseases, and unintentional injury, stroke continues to impose substantial individual and societal burdens.[1,2] For instance, each year nearly 800,000 people continue to experience a new or recurrent stroke, and stroke is still responsible for about 1 of every 20 deaths in the United States.[1] It is projected that between 2012 and 2030, the total direct medical stroke–related costs will triple, from $71.55 billion to $184.13 billion. Similar up-trend projections are also suggested for indirect costs, which are expected to double during the same periods of time.[3]

Hypertension is the pre-eminent modifiable stroke risk factor affecting nearly 1 of 3 Americans aged ≥20 years according to 2009-2012 data.[1] It is associated with a higher mortality among stroke patients, and arguably has a stronger association with stroke than any other symptomatic vascular disease entity.[1] Altogether, the annual cost of hypertension was more than $193 billion in medical care and about $123 billion in lost productivity in 2011-2012 (heart disease and stroke). Yet, despite notable hypertension and stroke-related costs, how both interrelate, and especially the nature of stroke-related costs among hypertensive individuals at a population level, is poorly understood. Obtaining information about health-care expenditures associated with hypertension by stroke status may provide insights into the economic burden of stroke in the group of patients most susceptible to it and enhance health-care policy and resource planning. In this study, we sought to assess U.S. health-care expenditures on stroke among individuals with and without hypertension, as well as assess these trends over the last decade.

Methods

Data Source and Sample

The Medical Expenditure Panel Survey (MEPS) is a U.S. civilian noninstitutionalized, large-scale nationally representative survey maintained and cosponsored by the Agency for Healthcare Research and Quality, conducted since 1996. We used the retrospective database analysis of 2003-2014 Medical Expenditure Panel Survey Household Component (MEPS-HC) to estimate the cost of stroke among adults with hypertension (aged ≥18 years).[4,5] Information related to participants' use of medical resources, their medical spending, demographics, socioeconomic variables, and health conditions are collected in MEPS. Information on the MEPS-HC are collected by self-report, and the Medical Provider Component requests data on medical and financial characteristics from hospitals, physicians, home health-care providers, and pharmacies in order to validate and supplement information received from the MEPS-HC respondents. In addition, several quality assurance procedures, including the validation on the interviewer's work and the comparison of MEPS numbers with other data source numbers like the Census Bureau and National Health Interview Survey, are used by the Agency for Healthcare Research and Quality to validate MEPS as a self-reported instrument.[6]

Diagnoses coded according to the International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) are also collected as part of the Medical Provider Component.[5] We merged data from the MEPS-HC survey of the medical condition files and full-year consolidated files using the unique sample person identifier on a one-to-one match. We pooled 12-year data to ensure a sufficient sample size of individuals with stroke and increase the precision of our estimates. The medical conditions and procedures reported by the MEPS-HC related to disease condition was recorded by an interviewer as verbatim text and then converted by professional coders to ICD-9-CM codes. The error rate for any coder did not exceed 2.5% on verification. To protect the confidentiality of respondents, fully specified ICD-9-CM codes were collapsed to three digits.[5] Our study accounts for the sampling weights, clustering, and stratification design to estimate the nationally representative aggregate and incremental health-care expenditure for the US population.[4]

Medical expenditures are defined as the payments that health-care providers receive from all payers (including insurance providers, survey respondents, and other sources) as well as out-of-pocket expenditures by individuals.[4] Medical costs used in this study were inflated to the recent estimate of 2016-dollar value using the consumer's price index obtained from the Bureau of Labor Statistics.[7]

Variables of Interest

The dependent variable in this study was total health-care expenditure, defined as a sum of inpatient hospital expenditure, hospital outpatient expenditure, prescription medicine expenditure, emergency room expenditure, home health-care expenditure, and other medical expenses.[4] Diagnosis-defined "hypertension" was identified by ICD-9-CM code or self-reported. The ICD-9-CM code of hypertension was based on 401 (essential hypertension).[4] Self-reported hypertension indicates a "yes" response to the question, "Have you ever been diagnosed as having a high blood pressure (hypertension)?" People with stroke were identified based on ICD-9-CM codes or self-report. *ICD-9-CM diagnostic codes* of stroke were based on 431 (Intracerebral Hemorrhage), 433 (Precerebral Occlusion), 434 (Cerebral Artery Occlusion), 436 (Cerebral Vascular Disease), and 438 (Late Eff Cerebrovascular Disease). Self-reported stroke was based on a "yes" response to the following question: "Have you ever been told by a health professional that you have had a stroke or transient ischemic attack (mini stroke)?"