The 20th century witnessed marked improvements in public health and drastic reductions in mortality from common diseases of early- and midlife leading to a large and growing segment of the population over the age of 65. These demographic trends are expected to continue in the coming decades. As a result, demographers are forecasting an increase in the number of persons with common chronic conditions of aging. Among the most common, most feared, and most expensive conditions for individuals, families, and society is progressive dementia. Recent data suggest that the number of persons with dementia in the world will increase markedly over the coming decades. Accurate forecasts of the occurrence of dementia and other age-related conditions in the future are essential for proper public health planning. However, such forecasts rely on a number of assumptions in addition to census projections regarding fertility, mortality, and immigration. For example, after Alzheimer disease, stroke is generally considered to be the second most common cause of dementia. Recent data suggest that the lifetime risk of both stroke and dementia are very high. In addition, health care utilization costs of dementia related to stroke appears to exceed that of Alzheimer disease on a per patient basis. These data suggest that recent trends in the incidence of and survival from stroke could have important implications for future estimates of the occurrence of dementia and the costs associated with dementia care. Unfortunately, information on the association of trends in stroke incidence and survival with the occurrence of dementia is limited.

In this issue of Stroke, Ukrainsteva et al linked data from the National Long-Term Care Survey (NLTCS) to data from Medicare Part A to compare stroke incidence and survival, and rates of dementia from 1984 to 1990 to 1991 to 2001 for persons over the age of 65 in the United States. The NLTCS is a nationally representative sample of >40,000 Medicare enrollees in the United States. Medicare Part A is the insurance program that covers inpatient care and a variety of posthospitalization skilled care. Diagnoses of stroke, dementia, and dementia subtypes were based on ICD-9-CM diagnostic codes. Dementia diagnoses were separated into 3 all inclusive and mutually exclusive hierarchical categories: Alzheimer disease, dementia related to cerebrovascular disease, and other dementias. Persons with dementia before stroke were excluded from the analyses. The authors found a slight increase in age-adjusted rates of stroke that approached significance. Stroke survival increased markedly, with most of the increase apparent in the first year after stroke consistent with lower stroke case fatality. The authors also found a substantial increase in the age adjusted rates of dementia, mostly attributable to an increase in Alzheimer disease. Finally, among those with stroke, there was a nearly 4-fold increase in dementia related to cerebrovascular disease. Interestingly, there was more than a 50% increase in Alzheimer disease among those with stroke, which approached but was not significant. By contrast, among those without stroke, there was more than a 50% increase in Alzheimer disease, more than a 25% increase in dementia related to cerebrovascular disease, and a small increase in other dementias.

The study is not without limitations, most of which were acknowledged by the authors. Most importantly, cases were restricted to hospitalized patients. However, many people with dementia and some with stroke do not come to the attention of the health care system. The reason some are hospitalized and others are not is likely to vary by age and socioeconomic status. For example, rates of stroke and dementia in this study appear to decline after age 90, which is inconsistent with most epidemiologic studies, although data for this age group are sparse. Further, because of changes in reimbursement over the past 2 decades, fewer persons with uncomplicated diagnoses are hospitalized, suggesting that more severe strokes, perhaps those more likely to be associated with dementia, may be over-represented in this study. Finally, uniform diagnostic procedures were not used, which also could introduce bias. Nonetheless, the study provides unique and potentially important data regarding the relation of secular trends in stroke and the occurrence of dementia over the past 2 decades. Data such as these are essential for determining the public health burden of stroke and dementia in the future.

The data in this study suggest that an ongoing decline in case fatality from stroke may be contributing to a rise in dementia, both dementia attributable to cerebrovascular disease, and dementia resulting from Alzheimer disease. Because it is likely that survival from stroke will continue to improve in the coming years, this may portend an increase in the numbers of stroke-related dementia in the future. These changes may be compounded, to some extent, by a slight increase in stroke incidence, although trends in stroke incidence remain controversial. The rise in stroke incidence, if present, is likely to be occurring primarily among the
elderly who represent those at highest risk for dementia. In the coming decades, the slight rise in stroke incidence may be exacerbated by other trends in the prevalence of vascular risk factors including obesity and diabetes among young and middle aged adults.\textsuperscript{13,14} Together, these trends may counterbalance, to some degree, the general decline in age-related disability that has been accruing over the past 2 decades.\textsuperscript{15,16}

It is interesting to note that although most of the increased risk of dementia associated with stroke was coded as dementia related to cerebrovascular disease, there was also a substantial increase in Alzheimer disease diagnosis among those with stroke. This is consistent with recent data suggesting that risk factors for stroke such as high blood pressure and diabetes may be associated with risk of Alzheimer disease,\textsuperscript{17,18} and that some well known risk factors for Alzheimer disease such as apolipoprotein E allele status may also be associated with risk of cerebral infarctions.\textsuperscript{19} The mechanisms linking stroke and stroke risk factors to Alzheimer disease are complicated, and it is premature to conclude that vascular disease or vascular risk factors cause amyloid deposition and tangle formation, the pathologic hallmarks of Alzheimer disease. It is now fairly clear from both imaging and clinical-pathologic studies that subclinical cerebrovascular disease is associated with risk of dementia.\textsuperscript{20,21} Further, clinical-pathologic studies suggest that cerebral infarction may add or interact with Alzheimer disease pathology to cause dementia.\textsuperscript{22,23} Thus, it is likely that clinical and subclinical cerebrovascular disease are capable of unmasking the pathology of Alzheimer disease leading to dementia. Further research is needed to see whether there are other more direct links between cerebrovascular disease and Alzheimer disease. The data from this study suggest that now would be a good time to conduct this research.

References


Key WORDS: dementia ■ epidemiology ■ stroke
Secular Trends in Stroke Incidence and Survival, and the Occurrence of Dementia
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