

Impact of Patients' Income on Stroke Prognosis

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Background: For patients diagnosed with stroke, the association between socioeconomic status and patient outcomes is poorly understood. Our objective was to define the impact of patients' socioeconomic status on their prognosis after stroke in the United States. *Methods:* Utilizing the Nationwide Inpatient Sample, we identified discharges involving a diagnosis of stroke from 2008 to 2013. Cohort was dichotomized to low-income patients (L-patients) and not-low-income patients (NL-patients). Z-test statistic was used to test the impact of income on stroke outcome. *Results:* The reported annual total in-hospital mortality for L-patients and NL-patients diagnosed with stroke at U.S. hospitals decreased significantly during the study period ($P < .001$). The mortality of L-patients decreased significantly from 1759 (4.16%) to 955 (2.54%) during study period. Similarly, NL-patients' mortality decreased significantly from 4818 (4.52%) to 2300 (2.47%) during the same period. The difference between the annual total in-hospital mortality for L-patients and NL-patients due to stroke was statistically significant throughout the entire study period ($P < .0001$). Notably, from 2008 to 2013, the annual total routine discharges, annual total discharges to short-term hospital, annual total discharges to another institution, and annual total discharges to home health care were statistically significantly different between the 2 populations of patients ($P < .0001$). *Conclusions:* Socioeconomic status has an impact on patient outcome after treatment of stroke in hospitals in the United States. Further study is needed to investigate the etiology of these differences between patients' socioeconomic status and their clinical outcomes after stroke. **Key Words:** Stroke—socioeconomic status—mortality—neurological surgery—economics—prognosis. Published by Elsevier Inc. on behalf of National Stroke Association.

Introduction

Stroke is one of the leading causes of morbidity and mortality worldwide and is responsible for 5 million deaths and 5 million disabilities in the United States every year.¹ Considering the high incidence of this clinical condition, the outcomes of patients with this pathology are significant for both patients and healthcare institutions. However, for institutions, the financial burden and economic aspects of stroke emphasize the importance of

patient outcomes after treatment of this diagnosis, which may be affected by patients' socioeconomic status (SES). However, after review of the current literature for patients with stroke, the association between SES and patient outcomes of this clinical diagnosis is unclear. Utilizing a robust database, we sought to determine patient outcomes after stroke treatment and the impact of patients' SES on these sequelae in the United States.

Methods and Statistical Analysis

Utilizing the Nationwide Inpatient Sample database, we identified 853,839 discharges involving a diagnosis of stroke (Medicare Severity-Diagnosis Related Group (MS-DRG) 66) from 2008 to 2013 in the United States. Our institution exempted this analysis from full review by Institutional Review Board. Year-wise distribution of in-hospital mortality, routine discharge, discharge to short-term hospital, discharge to another institution, discharge

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Received March 27, 2016; accepted May 17, 2016.

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1052-3057/\$ - see front matter

Published by Elsevier Inc. on behalf of National Stroke Association.

<http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2016.05.024>

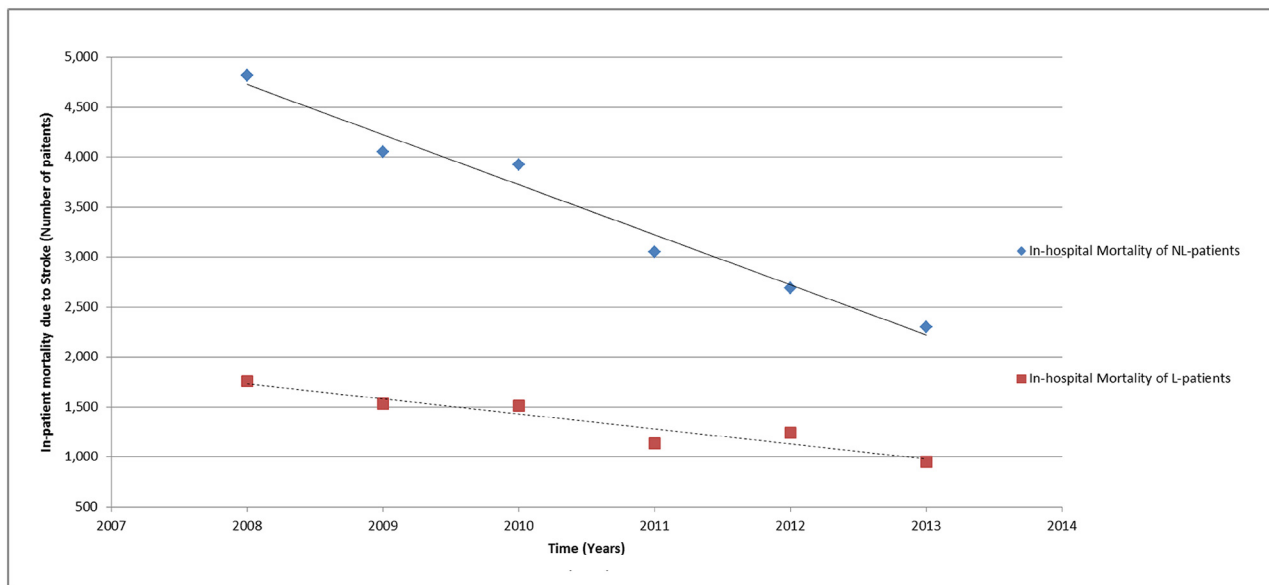


Figure 1. Patient income and annual total in-hospital mortality due to stroke. Abbreviations: L-patients, low-income patients; NL-patients, not-low-income patients; ◆ in-hospital mortality of NL-patients; ■ in-hospital mortality of L-patients.

to home health care, and discharge against medical advice for patients diagnosed with stroke at hospitals whose income was lower than median income for zip code (low-income patients; L-patients) and whose income was not lower than median income for zip code (not-low-income patients; NL-patients) was described. We defined patient income, lower or not lower than the median for zip code, as a socioeconomic indicator of SES. Z-test statistic was used to compare the 2 groups. The majority of cases (46.92%) were between 65 and 84 years old, with a mean age of 69 years old, of which 50.91% were male. The annual total in-hospital mortality for L-patients and NL-patients diagnosed with stroke at U.S. hospitals decreased significantly during the study period ($P < .001$). The mortality of L-patients decreased significantly from 1759 (4.16%) to 955 (2.54%) during study period (Table 1, $P < .0001$). Similarly, NL-patients' mortality decreased significantly from 4818 (4.52%) to 2300 (2.47%) during the same period (Table 1, $P < .0001$). As demonstrated in Figure 1, the difference between the annual total in-hospital mortality for L-patients and NL-patients due to stroke was extremely statistically significant throughout the entire study period ($P < .0001$). Notably, from 2008 to 2013, the annual total routine discharges, annual total discharges to short-term hospital, annual total discharges to another institution, and annual total discharges to home health care were extremely statistically significantly different between the 2 populations of patients (Table 1, $P < .0001$). Also, as demonstrated in Table 1, the annual total discharges against medical advice for L-patients and NL-patients during stroke treatment were statistically significantly different throughout the entire study period ($P < .05$).

Discussion

In this study, we found that patient outcomes were consistently related to patients' income level or SES for patients diagnosed with stroke. Notably, there were significant differences between NL-patients and L-patients and their respective outcomes including the following: in-hospital mortality, routine discharge, discharge to short-term hospital, discharge to another institution, discharge to home health care, and discharge against medical advice. These results prompt query into the discrepancies between patients' SES and their outcomes after stroke treatment and the possible implications of this information for health-care financial planners of institutions.

The etiology of the differences in patient outcomes between NL-patients and L-patients may be multifactorial in nature. Previous studies have demonstrated a significant relationship between SES and cardiovascular and cerebrovascular diseases: Patients of lower SES have higher incidence of stroke and risk of mortality from stroke.²⁻⁴ Notably, Jaja et al⁵ reported that patients' SES is associated with subarachnoid hemorrhage inpatient mortality risk in the United States; however, SES does not influence the pattern of use of institutional care among survivors. Conversely, another study noted, "uninsured patients were consistently less likely to receive a craniotomy or spinal fusion for traumatic intracranial extraaxial hemorrhage and spinal vertebral fracture, respectively."⁶ It is important to address that insurance status was not associated with the likelihood of operative management in the subset of patients aged 65 years and older, which may reflect the fact that surgeons may be less willing to intervene in older patients regardless of insurance status.⁶

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