Admission Rates, Time Trends, Risk Factors, and Outcomes of Ischemic and Hemorrhagic Stroke From German Nationwide Data

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Study Question
What are the recent temporal trends in admission rates, risk factors, and mortality after ischemic and hemorrhagic stroke in Germany?

What Is Known and What This Paper Adds
There have been major advances in stroke care during the past decade with the evolution of better preventative strategies, acute therapies, and neurorehabilitation. However, it remains unclear whether this progress has translated into improved stroke rates, risk factors, and outcomes in the general population. This study’s results show that in Germany, from 2014 to 2019, there were improved rates of hospitalization in recent years but that the percentage of stroke hospitalizations resulting in death remained unchanged, particularly for patients with intracerebral hemorrhage. Congestive heart failure (CHF), lower extremity arterial disease (LEAD), and cancer were all associated with a greater risk of in-hospital mortality.

Methods
A diagnosis and procedure-related remuneration system (German Diagnosis Related Groups system) was introduced for all in-hospitalization services in Germany in 2003, enabling precise and comprehensive acquisition of defined cases of illness. The Research Data Centers of the Federal Statistical Office and the Statistical Offices of the Laender provided data for 2014–2019 for analysis of risk factors, in-hospital outcomes, and time trends related to acute stroke. All hospitalized patients with an acute stroke as their principal diagnosis were included in the analysis.

Results and Study Limitations
There were 1,882,930 hospitalizations coded as acute stroke in Germany between 2014 and 2019. Acute stroke admissions initially increased from 306,425 in 2014 to peak at 318,849 in 2017 before falling again to 312,692 in 2019, whereas percentage of stroke hospitalizations that resulted in death remained stable during this period at 8.5% in 2014 and 8.6% in 2019. In a multivariate model, the strongest predictors of in-hospital stroke mortality were hemorrhagic subtype (adjusted OR [aOR] = 3.06, 95% CI 3.02–3.10; p < 0.001), cancer (aOR = 2.11, 2.06–2.16; p < 0.001), CHF (aOR = 1.70, 1.67–1.73; p < 0.001), and LEAD (aOR = 1.76, 1.71–1.93; p < 0.001). Study limitations include potential miscoding of ICD codes, case-based rather than patient-based data acquisition, and hospitalization data may not reflect the full burden of stroke in the population.

Study Funding and Competing Interests
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