Trends in Prevalence and Outcomes of Aneurysmal Subarachnoid Hemorrhage in the United States

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Abstract

Background and Purpose

Lifestyle modifications and advances in surgical and endovascular techniques for treating unruptured intracranial aneurysm (UIA) have vastly evolved over the last few decades and may have reduced the incidence of aneurysmal subarachnoid hemorrhage (aSAH). However, the actual impact of these changes on the rates and outcomes of aSAH remain unexplored. Thus, we studied national prevalence and outcome trends of aSAH and changes of major risk factors over time.

Methods

We queried the National Inpatient Sample between 2006 and 2018 to identify adult patients admitted for treatment of UIA or aSAH. The Cochrane-Armitage test was conducted to assess linear trend of proportion of prevalence, inpatient mortality, hypertension, and current smoking status among aSAH admissions. Multivariable logistic regression was conducted to assess odds of presenting with aSAH versus UIA, in addition to odds of inpatient mortality among aSAH patients.

Results

A total of 159,913 patients presented with UIA and 133,567 presented with aSAH. Admissions for aSAH decreased by 0.97% (p<0.001) per year. Current smoking and hypertension were associated with higher odds of being admitted for aSAH as compared to treatment of UIA (OR: 1.38; 95% CI: 1.29-1.48 and OR: 1.15; 95% CI: 1.08-1.22, respectively). As compared to whites, blacks (OR: 1.32; 95% CI: 1.21-1.43), Hispanics (OR: 1.38; 95% CI: 1.25-1.52), and patients of other races/ethnicities (OR: 1.73; 95% CI: 1.54-1.95) had higher odds of presenting with aSAH. Rates of inpatient mortality among aSAH admissions showed no change over time (p=0.21). Among patients admitted with aSAH, current smoking and hypertension showed an upward trend of 0.58% (p<0.001) and 1.60% (p<0.001) per year, respectively.

Conclusion

Despite a downward trend in the annual frequency of hospitalizations for aSAH, inpatient mortality rates have remained unchanged in the US. Smoking and hypertension are increasingly prevalent among patients with aSAH. Thus, efforts to control these modifiable risk factors must be further strengthened.
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### Background

Lifestyle modifications and advances in surgical and endovascular techniques for treating unruptured intracranial aneurysms (UIA) have rapidly evolved over the last few decades and may have reduced the risk of SAH. however, the exact impact of these changes on the rates and outcomes of UIA remain unexplored. Thus, we studied national prevalence and outcome trends of UIA and changes of major risk factors over 15 years.

### Materials and Methods

We applied the national hospital samples between 2009 and 2010 to identify adult patients admitted for treatment of UIA or UIAH. The Care Trans-endoarterectomy data was conducted to assess trend in the proportion of patients with procedural mortality. The data were weighted to account for UIA admissions. Multivariate logistic regression was conducted to assess odds of presenting with UIA and UIAH in addition to odds of unruptured aneurysmal morbidity among UIA patients.

### Results

The trend analysis shows a significant increase in the annual occurrence of UIA, mortality rates remain unchanged. Despite efforts to reduce smoking and improve hypertension in the population, the risk of UIA and UIAH remains unchanged in recent years. Current smoking was associated with higher odds of presenting with UIA, while better smoking had higher odds of presenting for treatment of UIA. Although an explanation for this phenomenon has not been elucidated, it is possible that patients might have greater visual acuity immediately after aneurysm rupture, which in turn could reduce the volume of the hemorrhage.

### Conclusion

While our analysis shows a significant increase in the annual occurrence of UIA, mortality rates remain unchanged. Despite efforts to reduce smoking and improve hypertension in the population, the risk of UIA and UIAH remains unchanged in recent years. Current smoking was associated with higher odds of presenting with UIA, while better smoking had higher odds of presenting for treatment of UIA. Although an explanation for this phenomenon has not been elucidated, it is possible that patients might have greater visual acuity immediately after aneurysm rupture, which in turn could reduce the volume of the hemorrhage.