

Predictors of Decompressive Craniectomy Utilization in the United States

Faith C. Robertson BS; Hormuzdiyar H. Dasenbrock MD; Mohammad Ali Aziz-Sultan MD; Donovan Guittieres; Rose Du MD,

PhD; Ian F. Dunn MD; William B. Gormley MD

Harvard Medical School, Boston, MA

Cushing Neurosurgical Outcomes Center, Brigham and Women's Hospital, Boston, MA

Department of Neurological Surgery, Brigham and Women's Hospital, Boston, MA



Introduction

Prior research has shown that the utilization of decompressive hemicraniectomy (DHC) for stroke is increasing in the United States. The goal of this study was to evaluate what patient demographics (including social determinants of health) and hospital characteristics were associated with DHC utilization.

Methods

Patients with an acute ischemic stroke were extracted from the Nationwide Inpatient Sample (2002-2011).

Multivariate logistic regression evaluated independent predictors of DHC utilization. Predictors screened included year of admission, weekend admission, patient age, sex, insurance coverage, socioeconomic status, race/ethnicity, comorbidities, stroke risk factors (anticoagulation, atrial fibrillation, carotid dissection, carotid stenosis, hypercoaguablility, hyperlipidemia, tobacco use), and hospital characteristics.

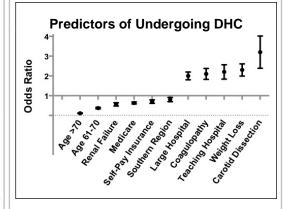
Severity indices (including neurologic deficits, altered sensorium, cerebral edema, and herniation) as well as treatment variables were covariates in regression constructs to account for severity of infarction.

Results

Of 774,595 ischemic stroke admissions, 1,705 underwent DHC (0.02%).

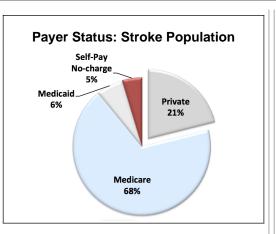
A predictive model evaluated predictors of DHC utilization, which had excellent discrimination (Cstatistic: 0.96).

Leading predictors were related to malignant progression: ventriculostomy, mechanical ventilation, cerebral edema, and herniation.

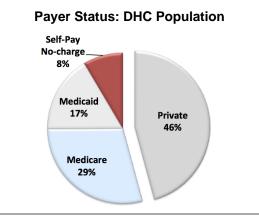


Older age predicted non-surgical treatment: age >70 years (odds ratio (OR): 0.11, 95% confidence interval (CI) 0.08-0.14); age 61-70; (OR: 0.11, 95% CI: 0.08-0.14); age 46-60 (OR: 0.61, 95% CI: 0.51-0.73). Other predictors are depicted below.

Payer status was also associated with DHC utilization, and patients with private insurance were most likely to undergo DHC.



Medicare recipients (OR: 0.63, 95% CI: 0.54-0.74, p<0.001) and uninsured patients (OR: 0.69, 95% CI: 0.53-0.88) had reduced DHC utilization compared to those with private insurance.



Additionally, teaching (OR: 2.24, 95% CI: 1.63-3.08); large (OR: 1.96, 95% CI: 1.61-2.38); and urban hospitals (OR: 1.82, 95% CI: 1.13-2.95) had increased DHC utilization. Other social attributes, including race/ethnicity and socioeconomic status, were not associated with utilization.

Conclusions

In this national analysis, predictors of undergoing DHC were largely dependent on clinical and institutional features (signs of malignant evolution, and larger, urban, and teaching hospitals). Increased academic center DHC utilization has been described previously (Bhattacharya et al.), and is attributed to more organized stroke care and available neurological and neurosurgical staff.

Predictors of not undergoing surgery had more associations with age and insurance status (Medicare, Selfpay/No charge insurance). DHC in older adults remains controversial. Some have suggested that patients aged 61-70 may benefit from DHC, while other studies (including DESTINY II) have included octogenerians (Juttler et al.).

Other social determinants of health were not predictive.

Decompressive hemicraniectomy is an effective treatment for malignant cerebral edema after stroke, and factors predicting DHC underutilization warrant further investigation.

References

- Bhattacharya P, Kansara A, Chaturvedi S, et al. What drives the increasing utilisation... JNNP. 2013
- · Vahedi K, Hofmeijer J, Juettler E, et al. Early decompressive surgery... The Lancet Neurology, 2007
- Juttler E, Unterberg A, Woitzik J, et al. Hemicraniectomy in older patients... NEJM. 2014

