# Unplanned Reoperation After Craniotomy for Tumor: A National Surgical Quality Improvement Program Analysis

Hormuzdiyar H. Dasenbrock MD; Sandra C. Yan BS, BA; Vamsidhar Chavakula MD; William B. Gormley MD; Timothy R. Smith MD, PhD, MPH; Elizabeth Claus MD; Ian F. Dunn MD

[Department of Neurosurgery; Brigham and Women's Hospital; Harvard Medical School]
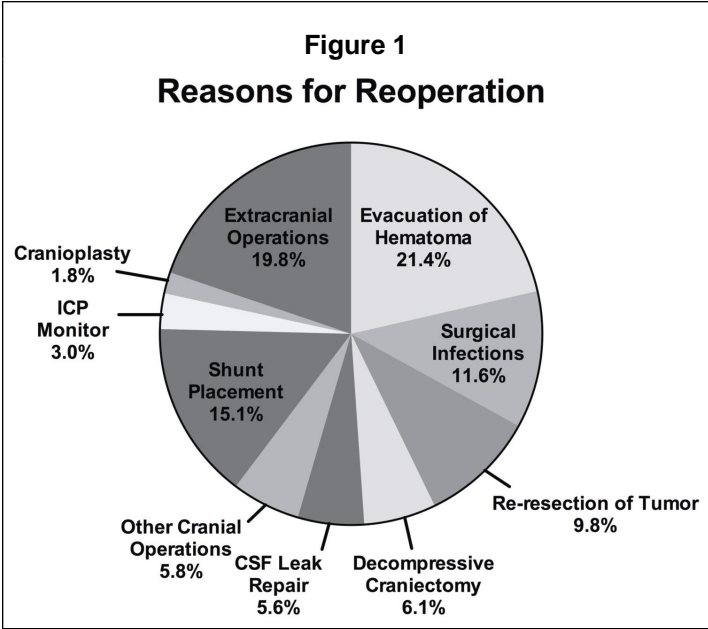
## Introduction

While reoperation has been utilized as a metric of quality of care, no national analysis has evaluated the rate of, reasons for, and predictors of unplanned reoperation after craniotomy for tumor.
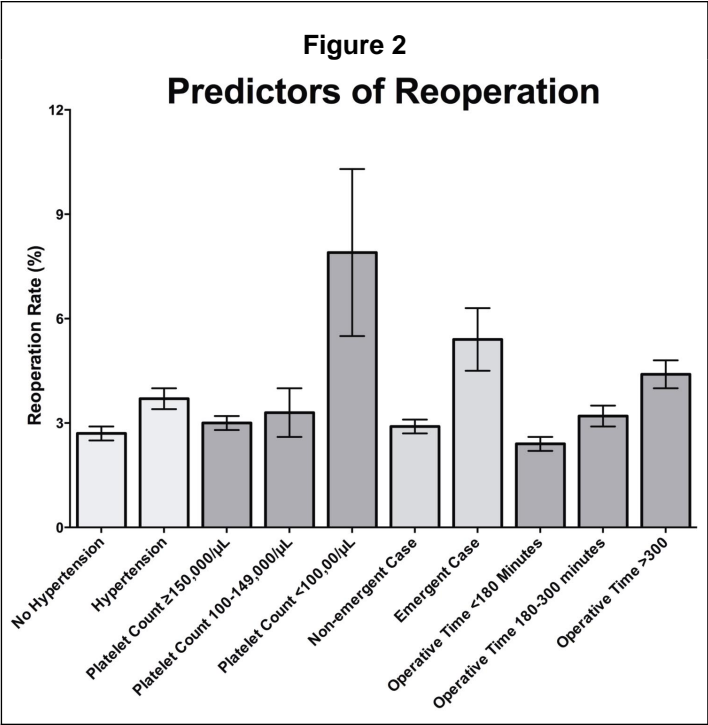
## Methods

Patients who underwent cranial tumor resection were extracted from the prospective National Surgical Quality Improvement Program registry (2012-2014). Multivariable logistic regression examined predictors of an unplanned cranial reoperation. Predictors screened included patient age; sex; tumor location and histology; functional status; comorbidities; preoperative laboratory values; and operative urgency and time.



**Figure 1**
**Reasons for Reoperation**

- Extracranial Operations 19.8%
- Evacuation of Hematoma 21.4%
- Cranioplasty 1.8%
- ICP Monitor 3.0%
- Surgical Infections 11.6%
- Shunt Placement 15.1%
- Other Cranial Operations 5.8%
- CSF Leak Repair 5.6%
- Decompressive Craniectomy 6.1%
- Re-resection of Tumor 9.8%

## Results

Of the 11,462 patients included, 3.1% (n=350) underwent an unplanned cranial reoperation. The most common reasons for cranial reoperation were intracranial hematoma evacuation (21.4%), superficial or intracranial surgical site infections (11.6%), re-resection of tumor (9.8%), decompressive craniectomy (6.1%), and repair of CSF leakage (5.6%) (Figure 1). The strongest predictor of any cranial reoperation was preoperative thrombocytopenia (less than 100,000/μL, odds ratio (OR)=2.51, 95% confidence interval (CI): 1.23-5.10, p=0.01) (Figure 2).



**Figure 2**
**Predictors of Reoperation**

_Reoperation Rate (%)_ — No Hypertension, Hypertension, Platelet Count ≥150,000/μL, Platelet Count 100-149,000/μL, Platelet Count <100,00/μL, Non-emergent Case, Emergent Case, Operative Time <180 Minutes, Operative Time 180-300 minutes, Operative Time >300

## Results (continued)

Thrombocytopenia, hypertension, emergent surgery, leukocytosis, and operative time greater than 300 minutes were predictors of reoperation for hematoma (p=0.03), while dependent functional status, morbid obesity, leukocytosis, and longer operative time were predictors of reoperation for surgical site infections (p=0.03). Infratentorial location, American Society of Anesthesiologists (ASA) class 3-5 designation, dependent functional status, leukocytosis, and operative time greater than 300 minutes were all predictors of reoperation for ventricular shunt placement (p=0.02).

Although any unplanned cranial reoperation was not associated with differential odds of mortality (OR=1.68, 95% CI: 0.94-3.00, p=0.08), hematoma evacuation was significantly associated with thirty-day death (OR=2.09, 95% CI: 1.03-4.25, p=0.04).

## Conclusions

In this NSQIP analysis, unplanned cranial reoperation was primarily associated with operative indices, rather than preoperative characteristics, suggesting that reoperation may have some utility as a quality indicator. Hypertension and thrombocytopenia were found to be potentially modifiable predictors of reoperation.