

**--- Supplemental Digital Content---**

**Infratentorial neurosurgery is an independent risk factor for respiratory failure and death following intracranial tumor resection**

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**Supplemental Table 1.** Common Procedural Terminology (CPT) Codes used for analysis.

<b>CPT CODE</b>	<b>DESCRIPTION</b>	<b>NUMBER OF CASES</b>
<b><i>SUPRATENTORIAL</i></b>		<b><i>1334</i></b>
61510	Craniectomy, trephination, bone flap craniotomy; for excision of brain tumor, supratentorial, except meningioma	933
61512	Craniectomy, trephination, bone flap craniotomy; for excision of meningioma, supratentorial	377
61526	Craniectomy, bone flap craniotomy, transtemporal (mastoid ) for excision of cerebellopontine angle tumor	26
<b><i>INFRATENTORIAL</i></b>		<b><i>365</i></b>
61518	Craniectomy for excision of brain tumor, infratentorial or posterior fossa; except meningioma, cerebellopontine angle tumor, or midline tumor at base of skull	213
61519	Craniectomy for excision of brain tumor, infratentorial or posterior fossa; meningioma	70
61520	Craniectomy for excision of brain tumor, infratentorial or posterior fossa; cerebellopontine angle tumor	65
61521	Craniectomy for excision of brain tumor, infratentorial or posterior fossa; midline tumor at base of skull	15

**Supplemental Table 2.** Variable definitions for exclusion criteria as described in the National Surgical Quality Improvement Program database.

VARIABLE	LABEL	VARIABLE OPTIONS AT ENTRY
ANESTHES	Principal anesthesia technique	Epidural General Local Monitored Anesthesia care None Other Regional Spinal Unknown
VENTILAT	Ventilator dependent	Yes; No; Unknown
ASACLAS	ASA classification	1-No Disturb; 2-Mild Disturb; 3-Severe Disturb; 4-Life Threat; 5-Moribound
COMA	Coma > 24 hours	Yes; No; Unknown
QUAD	Quadriplegia	Yes; No; Unknown
PREGNANCY	Pregnancy	Yes; No; Unknown

**Supplemental Table 3.** Primary outcome variables used for composite outcome of respiratory failure and death as described in the National Surgical Quality Improvement Program database.

VARIABLE	LABEL	DEFINITION
DREINTUB	Occurrences Unplanned Intubation	Patient required placement of an endotracheal tube and mechanical or assisted ventilation because of the onset of respiratory or cardiac failure manifested by severe respiratory distress, hypoxia, hypercarbia, or respiratory acidosis within 30 days of the operation. In patients who were intubated for their surgery, unplanned intubation occurs after they have been extubated after surgery. In patients who were not intubated during surgery, intubation at any time after their surgery is considered unplanned.
FAILWEAN	Occurrences Ventilator > 48Hours	<p>Total duration of ventilator-assisted respirations during postoperative hospitalization was greater than 48 hours. This can occur at any time during the 30-day period postoperatively. This time assessment is CUMULATIVE, not necessarily consecutive. Ventilator-assisted respirations can be via endotracheal tube, nasotracheal tube, or tracheostomy tube.</p> <p><i>We included only those who failed to wean within 48 hours immediately following intubation for their surgical procedure. Patients who failed to wean from ventilation following a re-intubation were not captured under this definition, but rather as an unplanned intubation.</i></p>
DOPERTOD	Days from operation to death	Days from operation to death. <i>Death was calculated from the number of data points collected under this variable as there is no standalone variable for death.</i>

**Supplemental Table 4.** Variable definitions for predictor variables.

VARIABLE NAME	VARIABLE LABEL	VARIABLE OPTIONS AT ENTRY
SEX	Gender	Male; Female
AGE	Age of patients	Age of patient with patients over 89 coded as 90+
HEIGHT	Height	
WEIGHT	Weight	
SMOKE	Current smoker within 1 year	Yes; No; Unknown
PACKS	Pack-years of smoking	
ETOH	EtOH > 2 drinks/day in 2 wks before admission	Yes; No; Unknown
DYSPNEA	Dyspnea	At rest; moderate exertion; no; unknown
FNSTATUS2	Functional health status Prior to Surgery	Independent; Partially Dependent; Totally Dependent; Unknown <i>In older databases, FNSTATUS1 may have been used instead, with same options</i>
HXCOPD	History of severe COPD	Yes; No; Unknown
CPNEUMON	Current Pneumonia	Yes; No; Unknown
IMPSENS	Impaired Sensorium	Yes; No; Unknown
PRBUN	Preoperative BUN	
PRALBUM	Pre-operative serum albumin	
EMERGENCY	Emergency case	Yes; No; Unknown
ANETIME	Duration of Anesthesia	
<i>Patients were considered to have "Cardiac Disease" if they had any of the following positive variables:</i>		
HXCHF	Congestive heart failure (CHF) in 30 days before surgery	Yes; No; Unknown
HXMI	History of myocardial infarction 6 mos prior to surgery	Yes; No; Unknown
PRVPCI	Previous PCI	Yes; No; Unknown
PRVPCS	Previous cardiac surgery.	Yes; No; Unknown
HXANGINA	History of angina in 1 month before surgery	Yes; No; Unknown
<i>Patients were considered to have "Neurologic Disease" if they had any of the following positive variables:</i>		
HEMI	Hemiplegia	Yes; No; Unknown
CVA	CVA/Stroke with neurological deficit	Yes; No; Unknown
PARA	Paraplegia	Yes; No; Unknown

**Supplemental Table 5.** Steps in development of the final multivariate model.

MODEL	VARIABLES*	CHANGE	N	AUROC	GOF
1	Age, functional status (tri), COPD, emergency surgery, BUN, albumin	Base model from Arozullah <i>et al</i>	811	0.71	0.51
2	Model 1 + surgical site, dyspnea (tri), cardiac disease, impaired sensorium, neurological disease, anesthetic duration	Add predictors with bivariate $p < 0.20$	811	0.75	0.36
3	Model 2 – BUN, albumin	Remove variables not independently associated with PRF	1697	0.77	0.96
4	Model 3 – COPD	Compare COPD and dyspnea variables	1697	0.76	0.92
5	Model 4 – Functional status	Compare neurological disease, impaired sensorium and functional status variables	1697	0.75	0.84

\* Functional status is a 3-level variable (totally dependent, partially dependent, independent); dyspnea is a 3-level variable (dyspnea at rest, dyspnea with moderate exertion, no dyspnea)

Abbreviations: AUROC, area under the receiver operating characteristic curve; BUN, blood urea nitrogen; COPD, chronic obstructive pulmonary disease; GOF, goodness of fit (Hosmer-Lemeshow).

**Supplemental Figure 1.** Patient selection.

Year of surgery	2006*	2007	2008	2009	2010	TOTAL
Total patients	152490	211407	271368	336190	363431	<b>1334886</b>
Neurosurgical patients	684	1313	3621	6186	8661	<b>20465</b>
Craniotomy for tumor	73	90	262	582	801	<b>1808</b>
<u>Exclusions</u>						
Ventilated	0	0	2	6	21	<b>29</b>
Coma	0	0	1	0	1	<b>2</b>
Quadriplegic	1	0	0	0	0	<b>1</b>
Pregnant	0	0	0	1	0	<b>1</b>
ASA class 5	0	1	1	0	0	<b>2</b>
>90 years old	0	0	1	1	1	<b>3</b>
Not a GA	0	4	4	26	37	<b>71</b>
Total excluded	1	5	9	34	60	<b>109</b>
<b>TOTAL</b>	<b>72</b>	<b>85</b>	<b>253</b>	<b>548</b>	<b>741</b>	<b>1699</b>

*\*Data from 2006 includes 33930 patients undergoing surgery in 2005; none of these patients had a neurosurgical procedure.*

**Supplemental Figure 2.** Adjusted risk of postoperative respiratory failure and death (composite outcome) for age and anesthetic duration, stratified by surgical location. Shaded areas represent 95% confidence intervals.

