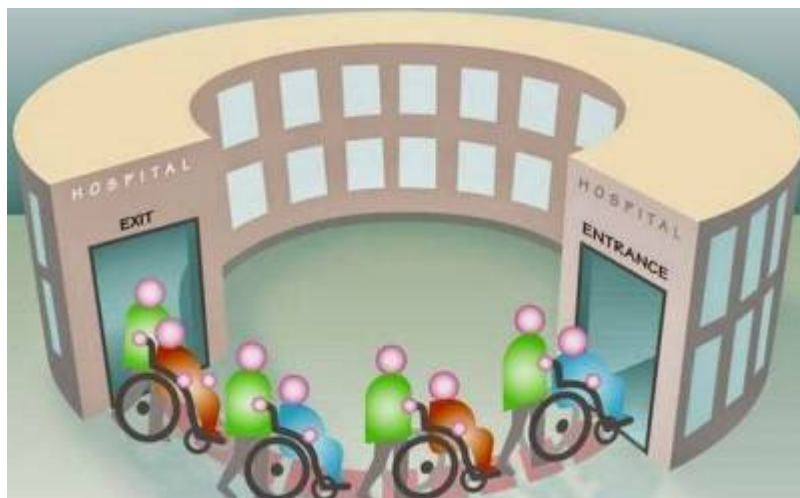# Unplanned hospital readmission after cranial neurosurgery

Many readmissions may be preventable and occur at predictable time intervals. The causes and timing of readmission vary significantly across neurosurgical subgroups. Future studies should focus on detecting specific complications in select cohorts at predefined time points, which may allow for interventions to lower costs and reduce patient morbidity [1].

Hospital readmission to a hospital (non-index) other than the one from which patients received their original care (index) has been associated with increases in both morbidity and mortality for cancer patients.

Of patient readmissions following brain tumor resection, 15.6% occur at a non-index facility. Low procedure volume is a confounder for non-index analysis and is associated with an increased likelihood of major complications and mortality, as compared to readmission to high-procedure-volume hospitals. Further studies should evaluate interventions targeting factors associated with unplanned readmission [2].

In a single-center Canadian experience. Almost one-fifth of neurosurgical patients were readmitted within 30 days of discharge. However, only about half of these patients were admitted for an unplanned reason, and only 10% of all readmissions were potentially avoidable. This study demonstrates unique challenges encountered in a publicly funded healthcare setting and supports the growing literature suggesting 30-day readmission rates may serve as an inappropriate quality of care metric in neurosurgical patients. Potentially avoidable readmissions can be predicted, and further research assessing predictors of avoidable readmissions is warranted [3].

A study of Elsamadicy et al. suggested that infection, altered mental status, and new sensory/motor deficits were the primary complications leading to unplanned 30-day readmission after cranial neurosurgery [4].

The preponderance of postdischarge mortality and complications requiring readmission highlights the importance of posthospitalization management [5].

Obstructive sleep apnea (OSA) is known to be associated with negative outcomes and is underdiagnosed. The STOP-Bang questionnaire is a screening tool for OSA that has been validated in both medical and surgical populations. Given that readmission, after surgical intervention is an undesirable event, Caplan et al. sought to investigate, among patients not previously diagnosed with OSA, the capacity of the STOP-Bang questionnaire to predict 30-day readmissions following craniotomy for a supratentorial tumor.

For patients undergoing craniotomy for treatment of a supratentorial neoplasm within a multiple-hospital academic medical center, data were captured in a prospective manner via the Neurosurgery Quality Improvement Initiative (NQII) EpiLog tool. Data were collected over a 1-year period for all supratentorial craniotomy cases. An additional criterion for study inclusion was that the patient was alive at 30 postoperative days. Statistical analysis consisted of simple logistic regression, which assessed the ability of the STOP-Bang questionnaire and additional variables to effectively predict outcomes such as 30-day readmission, 30-day emergency department (ED) visit, and 30-day reoperation. The C-statistic was used to represent the receiver operating characteristic (ROC) curve, which analyzes the discrimination of a variable or model.

Included in the sample were all admissions for supratentorial neoplasms treated with craniotomy (352 patients), 49.72% (n = 175) of which were female. The average STOP-Bang score was 1.91 ± 1.22 (range 0-7). A 1-unit higher STOP-Bang score accurately predicted 30-day readmissions (OR 1.31, p = 0.017) and 30-day ED visits (OR 1.36, p = 0.016) with fair accuracy as confirmed by the ROC curve (C-statistic 0.60-0.61). The STOP-Bang questionnaire did not correlate with 30-day reoperation (p = 0.805) or home discharge (p = 0.315).

The results of this study suggest that undiagnosed OSA, as assessed via the STOP-Bang questionnaire, is a significant predictor of patient health status and readmission risk in the brain tumor craniotomy population. Further investigations should be undertaken to apply this prediction tool in order to enhance postoperative patient care to reduce the need for unplanned readmissions [6].

Lopez Ramos et al., from the Department of Neurological Surgery, University of California San Diego, La Jolla, CA, USA, examined clinical risk factors and postoperative complications associated with 30-day unplanned hospital readmissions after cranial neurosurgery.

They queried the American College of Surgeons National Surgical Quality Improvement Program database from 2011-2016 for adult patients that underwent a cranial neurosurgical procedure. Multivariable logistic regression with backwards model selection was used to determine predictors associated with 30-day unplanned hospital readmission.

Of 40,802 cranial neurosurgical cases, 4,147 (10.2%) had an unplanned readmission. Postoperative complications were higher in the readmission cohort (18.5% vs 9.9%, p <0.001). On adjusted analysis, clinical factors predictive of unplanned readmission included hypertension, COPD, diabetes,

coagulopathy, chronic steroid use, and preoperative anemia, hyponatremia, and hypoalbuminemia (all p ≤ 0.01). Higher ASA class (III-V), operative time >216 minutes, and unplanned reoperation were also associated with an increased likelihood of readmission (all p ≤0.001). Postoperative complications predictive of unplanned readmissions were wound infection (OR 4.90, p <0.001), pulmonary embolus (OR 3.94, p <0.001), myocardial infarction/cardiac arrest (OR 2.37, p <0.001), sepsis (OR 1.73, p <0.001), deep venous thrombosis (1.50, p=0.002), and urinary tract infection (OR 1.45, p=0.002). Female sex, transfer status, and postoperative pulmonary complications were protective of readmission (all p <0.05)

Unplanned hospital readmission after cranial neurosurgery is a common event. Identification of high-risk patients who undergo cranial procedures may allow hospitals to reduce unplanned readmissions and associated healthcare costs [7].

Cusimano et al., conducted a systematic review of several databases; a manual search of the Journal of Neurosurgery, Neurosurgery, Acta Neurochirurgica, Canadian Journal of Neurological Sciences; and the cited references of the selected articles. Quality review was performed using the STROBE statement (Strengthening the Reporting of Observational Studies in Epidemiology) criteria. Findings are reported according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

A total of 1344 articles published between 1947 and 2015 were identified; 25 were considered potentially eligible, of which 12 met inclusion criteria. The 30-day readmission rates varied from 6.9% to 23.89%. Complications arising during or after neurosurgical procedures were a prime reason for readmission. Race, comorbidities, and longer hospital stay put patients at risk for readmission.

Although readmission may be an important indicator for good care for the subset of acutely declining patients, neurosurgery should aim to reduce 30-day readmission rates with improved quality of care through systemic changes in the care of neurosurgical patients that promote preventive measures [8].

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