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Surgical Treatment, Length of Stay, and In-Hospital Mortality Among Patients With Intracranial Tumors at a Tertiary Centre in Angola: A Retrospective Cohort Study

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Abstract

Background

Neurosurgical admissions for intracranial tumours are clinically demanding and resource intensive. The relation between surgery, hospital length of stay, and in-hospital outcome is not straightforward in routine datasets because operative selection is shaped by tumour characteristics, neurological status, frailty, urgency, and therapeutic intent. This study examined whether surgery was associated with longer hospital stay and whether it was associated with in-hospital death in a tertiary-hospital cohort of tumour admissions.

Methods

This retrospective observational study included 93 tumour-related admissions recorded in an institutional registry between 2020 and 2025. The unit of analysis was the admission. Surgical status was classified as operated or not operated. Length of stay and in-hospital outcome were compared by surgical status. Length of stay was summarised as mean ± standard deviation and median with interquartile range. The Mann-Whitney test was used for length-of-stay comparisons, and the association between surgery and in-hospital death was examined with an odds ratio, 95% confidence interval, and Fisher exact test. Registry entries coded as “SD” were treated as missing.

Results

Of 93 admissions, 41 (44.1%) were recorded as surgical and 52 (55.9%) as non-surgical. Across the full cohort, mean length of stay was 29.4 ± 24.6 days, median length of stay was 23.0 days (IQR 10.8–37.0), and the observed range was 1-128 days. Surgical admissions had a markedly longer median length of stay than non-surgical admissions (35.5 vs 14.5 days; p = 0.00005). Surgery was not associated with in-hospital death (OR 0.94, 95% CI 0.35–2.50; p = 1.000). Length of stay did not differ between admissions ending in death and those not ending in death (median 21.0 vs 23.0 days; p = 0.892). Overall outcomes were discharge in 67 admissions, death in 21, transfer in 4, and indeterminate status in 1.

Conclusions

In this institutional cohort, surgery was associated with substantially longer hospital stay but not with in-hospital death. In routine registry data, surgical status appears to capture care-pathway intensity and resource use more clearly than short-term mortality risk.

Introduction

Primary intracranial tumours comprise a heterogeneous group of diseases with substantial variation in biology, anatomical location, symptom burden, and treatment strategy. Contemporary disease classifications and guideline documents have reinforced the need to interpret hospital admissions within a broader neuro-oncological framework that includes diffuse gliomas, meningiomas, pituitary adenomas, and other central nervous system neoplasms [1–7]. Across these entities, inpatient care is often triggered by raised intracranial pressure, seizures, focal neurological deficit, hydrocephalus, visual compromise, or progressive functional decline, all of which may require rapid imaging, multidisciplinary evaluation, and time-sensitive treatment planning [1–7,19,20].

Surgery remains central to the management of many intracranial tumours. Depending on the clinical context, it may establish diagnosis, relieve mass effect, reduce tumour burden, improve symptoms, provide tissue for molecular characterisation, or facilitate adjuvant treatment [1–7]. The decision to operate, however, is rarely determined by diagnosis alone. Tumour location, resectability, neurological condition, age, frailty, comorbidity, urgency, and therapeutic intent all influence operative selection [3,4,14–18]. For that reason, the surgical and non-surgical groups in routine hospital datasets are not directly comparable, and crude inpatient contrasts need careful interpretation.

Length of stay is an important hospital-level outcome in tumour care because it captures both clinical complexity and service organisation. Prior studies have shown that inpatient duration after brain tumour surgery is shaped not only by the procedure itself but also by baseline comorbidity, perioperative complications, discharge disposition, hospital context, and access to rehabilitation or step-down care [8–13,21–23]. In practice, total admission time reflects the combined effects of preoperative work-up, theatre scheduling, postoperative monitoring, medication adjustment, rehabilitation planning, and discharge coordination. It is therefore a useful measure of resource utilisation even when it is not a direct proxy for long-term oncological benefit.

In registry-based datasets, the relation between surgery, hospital stay, and short-term outcome is often difficult to disentangle. Surgical admissions may accumulate bed-days because they follow a more complex pathway, whereas non-surgical admissions may include patients with unresectable disease, poor operative candidacy, advanced illness, or transfer needs. In that setting, surgery may function less as a simple exposure and more as a marker of care-pathway intensity. The present study examined whether surgical status was associated with longer hospital stay and whether it was associated with in-hospital death among admissions for intracranial tumours in a tertiary institution in Luanda, Angola.

Methods

Study design and setting

We conducted a retrospective observational cohort study using routine institutional registry data from tumour-related neurosurgical admissions recorded between 2020 and 2025 at Hospital do Prenda, Luanda, Angola. The unit of analysis was the admission rather than the individual patient.

Data source and eligibility

The analysis was based on the institutional tumour admissions registry. Admissions included in the dataset were those recorded as related to intracranial tumour care during the study period. Registry-based diagnoses were retained for contextual description, but the present analysis focused on surgical pathway and hospital utilisation rather than diagnosis-specific outcome estimates.

Variables

The exposure of interest was surgical status, classified from registry fields as operated or not operated. The primary outcome was hospital length of stay, measured in days. The secondary outcome was in-hospital death. Overall in-hospital disposition was also described with the categories discharge, death, transfer, and indeterminate status. Registry entries coded as “SD” were treated as missing and were not imputed.

Statistical analysis

Length of stay was summarised as mean ± standard deviation and median with interquartile range because the distribution was expected to be non-normal. The Mann-Whitney test was used to compare length of stay between surgical and non-surgical admissions and between admissions ending in death and those not ending in death. The association between surgery and in-hospital death was examined with an odds ratio, 95% confidence interval, and Fisher exact test. Analyses were exploratory and univariable. No multivariable modelling was undertaken because of the limited dataset granularity and the potential for substantial residual confounding.

Reporting considerations

Because the study relied on routine registry data, completeness of surgical linkage and operative detail was assessed qualitatively in the manuscript. Exact linkage between admissions and the separate operating-room sheet was limited, and pathology linkage was incomplete. These constraints were considered when interpreting the findings.

Results

The cohort comprised 93 tumour-related admissions. Of these, 41 (44.1%) were recorded as surgical and 52 (55.9%) as non-surgical. Descriptive data and primary comparisons are summarised in Table 1.

Table 1
Cohort characteristics and primary comparisons according to surgical status.

Variable	Overall cohort	Surgical	Non-surgical	Comparison
Admissions, n (%)	93 (100.0%)	41 (44.1%)	52 (55.9%)	—
Mean LOS, days	29.4 ± 24.6	—	—	—
Median LOS, days	23.0	35.5	14.5	p = 0.00005
IQR, days	10.8–37.0	—	—	Not available by subgroup
Observed range, days	1-128	—	—	—
In-hospital death	21 events overall	—	—	OR 0.94 (95% CI 0.35–2.50); p = 1.000

Across the full cohort, mean length of stay was 29.4 ± 24.6 days, the median was 23.0 days (IQR 10.8–37.0), and the observed range was 1-128 days. Surgical admissions had a substantially longer median length of stay than non-surgical admissions (35.5 vs 14.5 days; p = 0.00005) as shown in Fig. 1.

Surgery was not associated with in-hospital death (OR 0.94, 95% CI 0.35–2.50; p = 1.000). Length of stay did not differ between admissions ending in death and those not ending in death (median 21.0 vs 23.0 days; p = 0.892). These outcome summaries are presented in Table 2.

Table 2
Length of stay and in-hospital outcome summary.

Outcome stratum	n	Length of stay summary	Comparison
Overall cohort	93	Mean 29.4 ± 24.6 days; median 23.0 days (IQR 10.8–37.0); range 1-128	—
Admissions ending in death	21	Median 21.0 days	vs non-death: p = 0.892
Admissions not ending in death	72	Median 23.0 days	Reference
Surgery and in-hospital death	—	—	OR 0.94 (95% CI 0.35–2.50); Fisher exact p = 1.000

Overall in-hospital disposition consisted of discharge in 67 admissions, death in 21, transfer in 4, and indeterminate status in 1 (as shown in Fig. 2).

Although surgical admissions accounted for less than half of all admissions, their markedly longer median stay suggests a disproportionate burden on bed occupancy. Figure 3 presents the admissions share together with the median length-of-stay indicator to illustrate this imbalance.

Surgical admissions represented 44.1% of all admissions but had a 2.45-fold longer reported median length of stay than non-surgical admissions.

Registry linkage and data-quality considerations relevant to interpretation are summarised in Table 3.

Table 3
Registry linkage and analytic constraints relevant to interpretation.

Domain	Status in current dataset	Implication for interpretation
Surgical classification	Available for all analysed admissions	Permits the primary exposure comparison
Exact registry-to-operating-room linkage	Limited	Raises the possibility of exposure misclassification
Detailed operative variables	Frequently unavailable	Precludes analysis by procedure type or operative complexity
Pathology linkage	Incomplete	Restricts diagnosis-specific interpretation
Multivariable covariates	Not sufficiently available	Precludes adjusted causal modelling

Discussion

This study found that admissions who were submitted to surgical treatment, had a substantially longer hospital stay than admissions recorded as non-surgical, whereas no association was detected between surgery and in-hospital death. The size of the difference in stay is operationally important. In this cohort, surgery appears to identify a more intensive inpatient pathway rather than a pathway marked by excess in-hospital fatality.

The length-of-stay finding is clinically credible and accords with previous work on tumour surgery admissions [8–13]. The operative episode is only one component of inpatient care. Total admission time may also include preoperative optimisation, imaging review, operating-room scheduling, postoperative observation, steroid and antiseizure management, wound surveillance, rehabilitation assessment, and discharge planning. In institutions working under bed constraints, these steps can extend stay even when the procedure itself is uncomplicated. The longer stay observed in the surgical group should therefore be interpreted primarily as a reflection of pathway complexity and resource use rather than as evidence of inferior care.

The absence of an observed association between surgery and in-hospital death requires a more cautious reading. Operative allocation in neuro-oncology is shaped by case selection. Patients offered surgery may differ from those managed non-operatively in age, frailty, neurological reserve, disease stage, tumour accessibility, and therapeutic intent [14–18]. Conversely, the non-surgical group may include admissions dominated by advanced disease, poor operative candidacy, diagnostic uncertainty, or transfer for onward care. Without adjustment for these factors, the present analysis cannot estimate the

causal effect of surgery on mortality. The current data support a narrower conclusion: surgical status, as recorded in this registry, did not discriminate in-hospital death in this cohort.

Length of stay also did not distinguish admissions ending in death from those not ending in death. That pattern suggests that fatal admissions did not cluster into one simple temporal profile, such as uniformly early catastrophic deterioration or uniformly prolonged complicated admission. In practice, inpatient duration in neuro-oncology may be influenced by several overlapping clinical and logistical determinants, including access to intensive care, infection surveillance, rehabilitation planning, family preparedness for discharge, and onward referral arrangements [9–13,19–23]. In this cohort, length of stay behaved more as a utilisation metric than as a direct marker of fatal outcome.

From a service-planning perspective, the findings are relevant because the median stay among surgical admissions was 35.5 days, compared with 14.5 days among non-surgical admissions. Even without exact subgroup bed-day totals, that contrast indicates that surgical tumour care is likely to account for a disproportionate share of ward occupancy. For hospitals facing pressure on beds, theatre access, and postoperative monitoring capacity, the most actionable response may lie in pathway redesign: earlier completion of preoperative work-up, improved coordination of surgery dates, standardised postoperative protocols, faster imaging turnaround, and structured discharge planning. These are the service components most likely to affect the length of surgical admission [8–13].

The study should also be interpreted in light of its limitations. The analysis was retrospective, based on admission-level registry data, and dependent on the completeness of routine documentation. Exact linkage with the separate operating-room sheet was limited, pathology linkage was incomplete, and operative detail was frequently unavailable. No multivariable modelling was attempted, and the possibility of residual confounding is substantial. Repeat admissions may not represent independent clinical trajectories. The manuscript therefore avoids causal language and treats the findings as an observational description of care-pathway intensity and hospital utilisation in one institution.

Notwithstanding these constraints, the study provides a useful institutional picture of tumour-related neurosurgical admissions in a setting from which published service-level data remain limited. The findings support the view that surgery is better understood here as a marker of pathway intensity and inpatient resource demand than as a determinant of in-hospital mortality.

Limitations

This analysis has several limitations. First, it relied on retrospective routine registry data collected for service purposes rather than for research. Second, the unit of analysis was the admission, and repeat admissions by the same patient could not be fully accounted for. Third, exact linkage between the registry and the separate operating-room sheet was incomplete, which may have introduced exposure misclassification. Fourth, pathology linkage and detailed operative variables were unavailable for a substantial proportion of entries. Fifth, the limited sample size and data granularity precluded

multivariable adjustment. Finally, the manuscript is confined to in-hospital outcomes and cannot address longer-term survival, readmission, functional recovery, or adjuvant treatment completion.

Conclusions

Among 93 intracranial tumour admissions in this institutional cohort, surgery was associated with a substantially longer hospital stay but not with in-hospital death. In routine retrospective hospital data, surgical status appears to reflect a more resource-intensive care pathway rather than a demonstrable determinant of inpatient mortality. These findings may help guide local service planning, particularly where bed occupancy and perioperative coordination are major constraints.

Declarations

Ethics Statement

This study involved retrospective analysis of de-identified routine institutional records and received approval from the Hospital do Prenda Ethics Committee (reference no. HP-DP 153/2026) on May 6, 2026. All study procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki and applicable Angolan regulations governing biomedical research and data protection. The requirement for informed consent was waived by the Ethics Committee in accordance with the Angolan Bioethics Research Law and the Angolan Data Protection Law because all data were fully anonymised before analysis

Consent for publication: Not Applicable

Author Contributions

MCM, MX, BSM, and CP contributed to data collection, curation, and interpretation. SN conceptualized and supervised the study, contributed to the methodology and statistical analysis, and drafted the manuscript. All authors critically revised the manuscript, approved the final version, and agreed to be accountable for the work.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

Data Availability Statement

The data derive from organised institutional clinical records. Access is subject to institutional authorisation and appropriate anonymisation.

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