Brain Tumor Data Analysis Report

Transforming 20,000 clinical records into actionable insights on diagnosis, treatment, and survival outcomes.

Project Overview & Business Problem

Objective

Analyze a brain tumor clinical dataset to identify patterns in patient demographics, tumor characteristics, treatment strategies, and survival outcomes — supporting early diagnosis and treatment planning.

Key Questions

- How do tumor type and stage impact survival?
- Which treatments result in better outcomes?
- What patient groups require closer monitoring?

20,000
Patient records analyzed

19
Clinical attributes per record

Structured
Medical dataset, analysis-ready

Methodology

Data Cleaning

Exploratory Analysis

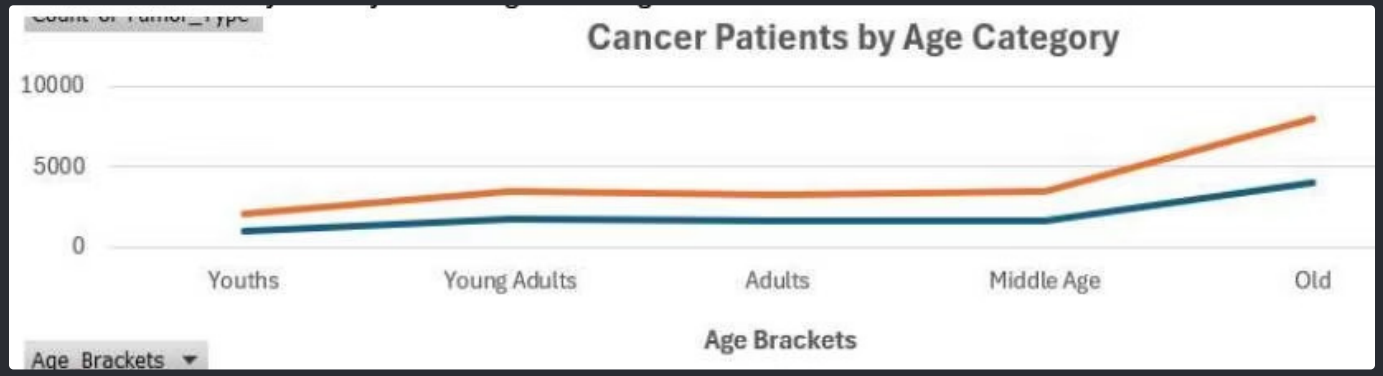
KPI & Trends

Dashboard Viz

Insight Generation

Dataset was verified for completeness, categorical variables standardized, and numerical ranges validated — requiring minimal preprocessing before analysis.

Patient Demographics



Key Demographic Findings

- Brain tumors most common in patients aged **35–65**
- Slight male dominance in tumor occurrence
- Family history linked to higher malignant tumor risk
- Total patients peak in the **Old** category (~8,000)
- Malignant cases peak in **Middle Age** (~1,500)

Tumor Characteristics & Location

Tumor Type Split

~52% Benign · **~48%** Malignant. Malignant cases concentrated in Stage III & IV with faster growth rates.

Most Affected Regions

Parietal Lobe, Temporal Lobe, and Frontal Lobe. Certain locations correlate with severe symptoms and advanced stages.

Stage Progression

Tumor size increases with stage progression. Malignant tumors show significantly faster growth rates than benign.

Treatment Effectiveness

Surgery

Most commonly used treatment across all tumor stages.

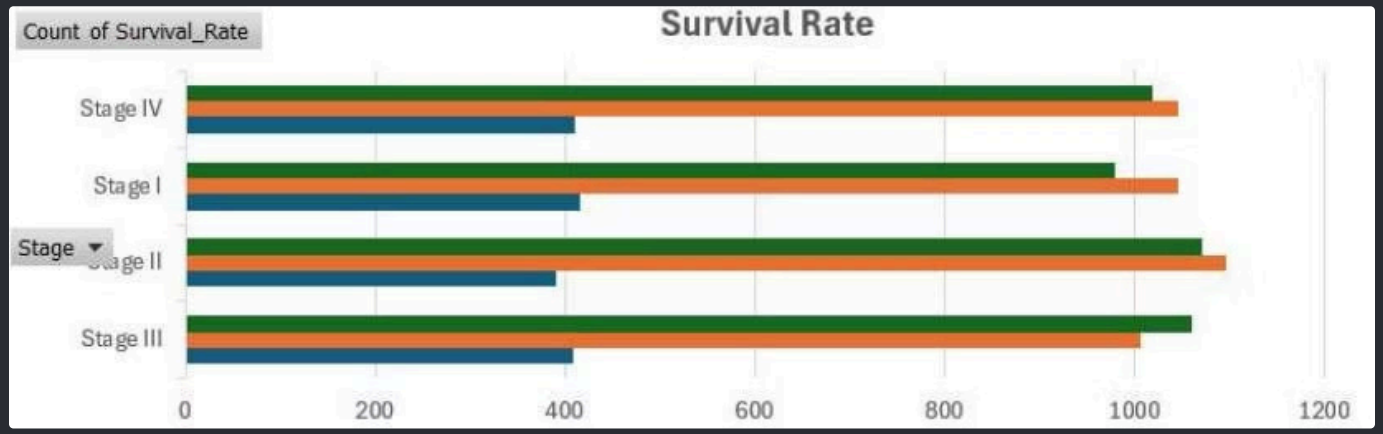
Chemo & Radiation

Primarily applied to advanced-stage tumors as targeted interventions.

Combination Therapy

Surgery + Chemo + Radiation yields the **highest survival rates** of all treatment approaches.

Survival Analysis by Stage

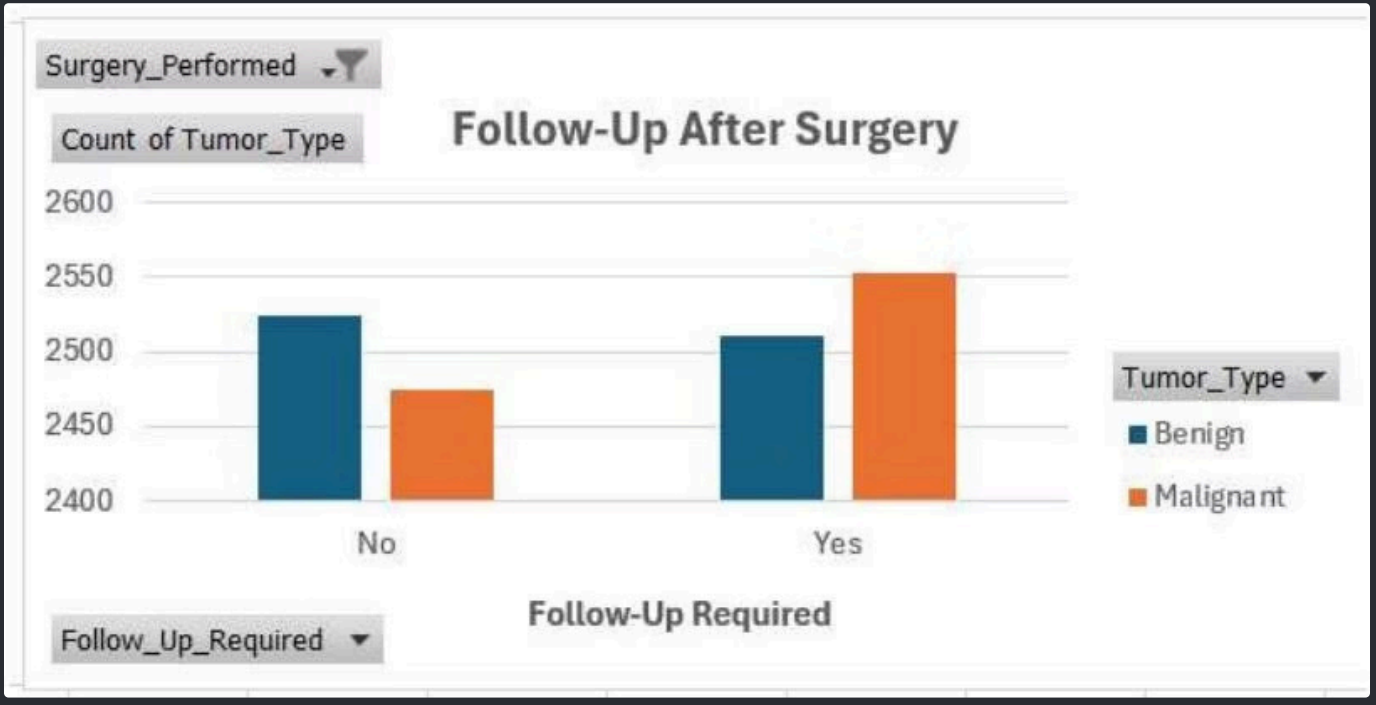


Survival Highlights

- Benign tumors: survival rates **above 80%**
- Malignant tumors: significantly lower survival, especially Stage IV
- Survival decreases sharply with stage progression

Key Insight: Early-stage detection is the single most impactful factor in improving patient survival outcomes.

MRI & Follow-Up Risk Analysis



MRI & Follow-Up Findings

- Positive MRI results strongly correlate with malignant tumors, larger size, and mandatory follow-ups
- Malignant patients requiring follow-up: **~2,550** vs. benign **~2,520**
- Follow-up requirement is a strong indicator of patient risk level

Business Impact & Recommendations

Business Impact

Early Diagnosis

Supports proactive screening strategies

Risk Prioritization

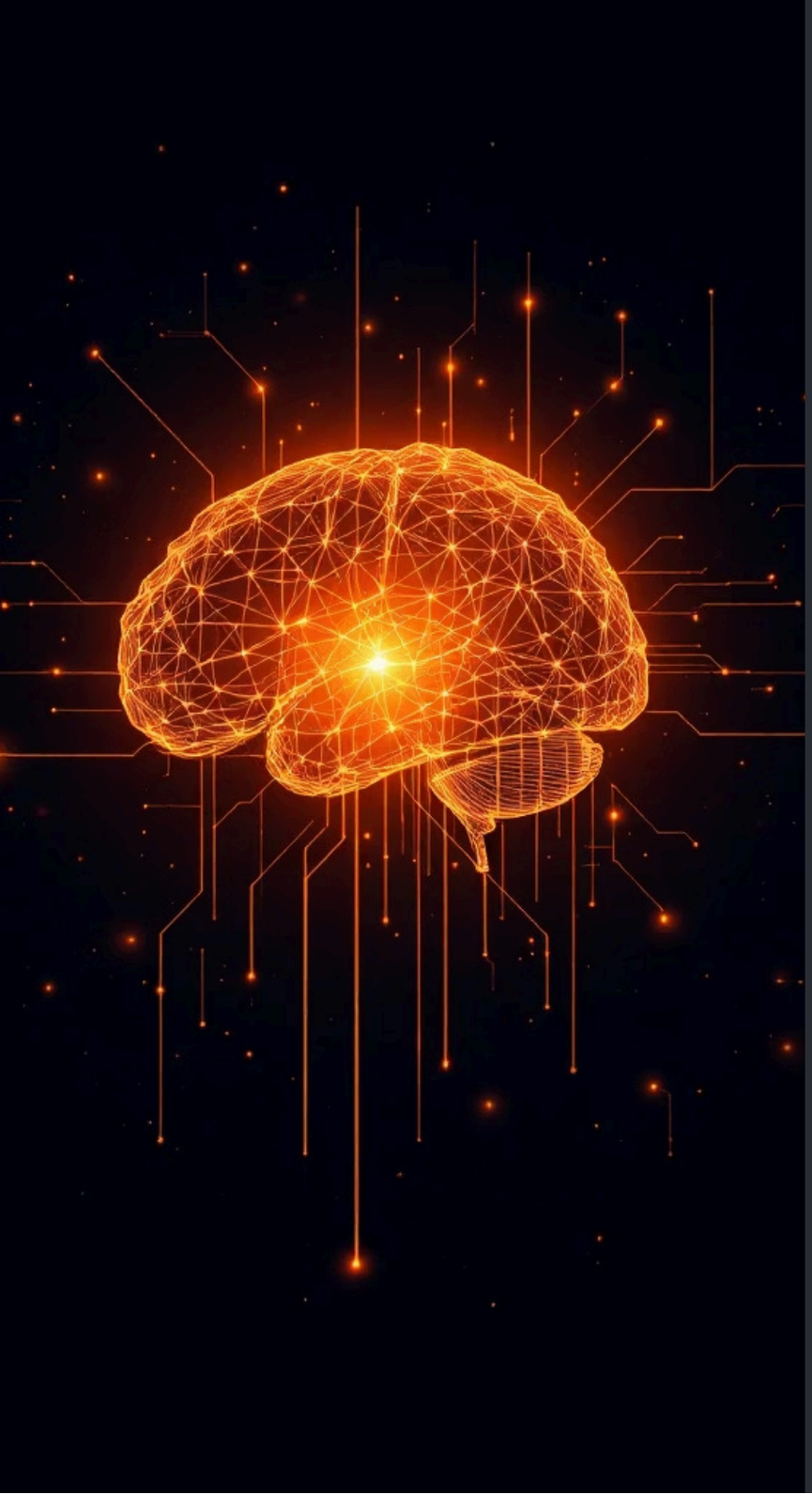
Helps doctors focus on high-risk patients

Treatment Planning

Improves data-driven clinical decisions

Recommendations

1. Introduce early screening for high-risk age groups (35–65)
2. Use tumor stage and MRI results as primary risk indicators
3. Apply combination therapy for advanced-stage cases
4. Build predictive models for survival estimation



Conclusion & Future Scope

This project demonstrates how structured healthcare data drives meaningful clinical insights — linking tumor characteristics, treatment strategies, and survival outcomes.

01

ML Survival Prediction

Machine learning models for outcome estimation

02

Real-Time Dashboard

Live hospital integration for continuous monitoring

03

Treatment Recommender

AI-driven therapy recommendation system

04

Time-Series Monitoring

Longitudinal patient tracking and analysis