1. Glioma Treatment (e.g., Astrocytoma, Glioblastoma)

Gliomas are primary brain tumors that arise from glial cells.

Treatment Options:

- **Surgery:** First-line for diagnosis and maximal tumor removal. Complete resection may not always be possible.
- **Radiation Therapy:** Standard post-operative treatment, especially in high-grade gliomas.
- **Chemotherapy:**
    - **Temozolomide (TMZ)** is the standard for glioblastoma.
    - PCV (Procarbazine, Lomustine, Vincristine) may be used for oligodendrogliomas.
- **Targeted Therapy:**
    - Bevacizumab (anti-VEGF) is considered for recurrent glioblastomas.
- **Tumor-Treating Fields (TTFs):** FDA-approved for glioblastoma.

Prognosis: Varies with grade (I–IV), molecular profile (IDH mutation, MGMT methylation), and resectability. Glioblastoma has a poor prognosis (~12–18 months median survival).

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2. Meningioma Treatment

Meningiomas arise from the meninges and are usually benign (WHO Grade I), but can be atypical or malignant.

Treatment Options:

- **Observation:** For small, asymptomatic, or incidental tumors.
- **Surgery:** First-line for accessible symptomatic tumors. Complete resection often curative in benign cases.
- **Radiation Therapy:**

    - Used for residual, recurrent, or high-grade (Grade II/III) tumors.
    - Stereotactic radiosurgery (e.g., Gamma Knife) for small, hard-to-reach tumors.
- **Medication:** Limited role; hormonal and targeted therapies under research for refractory cases.

Prognosis: Good in benign cases with total resection. Recurrence risk increases with higher grade and incomplete removal.

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3. Pituitary Tumor (Adenomas) Treatment

Pituitary tumors are mostly benign adenomas classified as functioning (hormone-secreting) or non-functioning.

Treatment Options:

- **Medical Therapy:**
    - **Prolactinomas:** First-line is **dopamine agonists** (e.g., **cabergoline**, **bromocriptine**).
    - **GH-secreting tumors (Acromegaly): Somatostatin analogs** (octreotide), **GH receptor antagonists** (pegvisomant).
    - **ACTH-secreting tumors (Cushing's disease):** Ketoconazole, metyrapone, or pasireotide.
- **Surgery:** Transsphenoidal resection is standard, especially for non-responsive or compressive tumors.
- **Radiation Therapy:** For residual or recurrent tumors post-surgery.

Prognosis: Generally good for benign adenomas. Lifelong hormone monitoring and replacement may be needed.

4. NO TUMOR (Normal Brain MRI or Non-Tumorous Condition)

Explanation:
A prediction of "**NO TUMOR**" indicates that the uploaded MRI does **not show signs of a brain tumor**. However, it's important to note that this doesn't completely rule out other neurological

conditions. MRI images can appear normal even in the presence of functional or microscopic abnormalities.

🔬 **Clinical Implications:**

- **No Radiological Evidence of Tumor:** The model has not detected abnormal growths or lesions typical of gliomas, meningiomas, or pituitary adenomas.
- **Further Evaluation:** In symptomatic patients (e.g., headache, seizures, cognitive changes), additional tests like EEG, functional MRI, or lumbar puncture might still be necessary.

🧠 **Possible Next Steps (if symptoms persist):**

1. **Neurological Assessment:** Clinical exam to check for subtle neurological deficits.
2. **Advanced Imaging:** Functional MRI, DTI, PET scan, or MR spectroscopy may provide more detail.
3. **Referral:** To a neurologist for non-tumor-related conditions such as:
    - **Epilepsy**
    - **Multiple Sclerosis**
    - **Vascular abnormalities**
    - **Infections (e.g., encephalitis)**
    - **Psychiatric disorders mimicking neurological symptoms**

✅ **Prognosis:**

- **Generally favorable** when MRI shows no tumor.
- Continued follow-up may be necessary if symptoms persist or worsen.