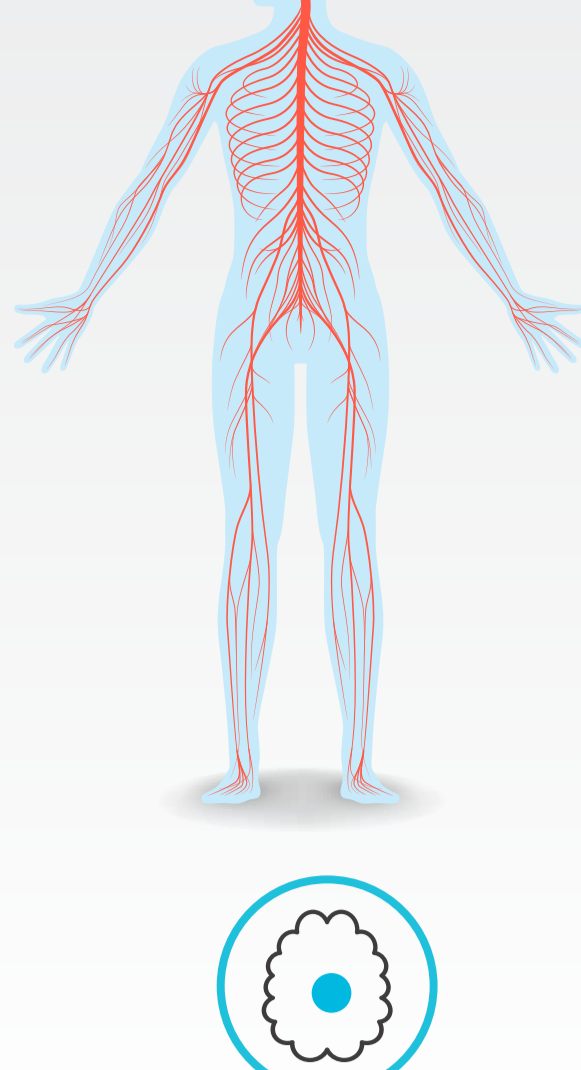


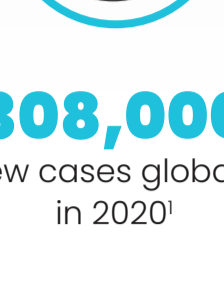
# A SIMPLE GUIDE TO CENTRAL NERVOUS SYSTEM (BRAIN & SPINE) TUMORS

## WHAT ARE CNS TUMORS?

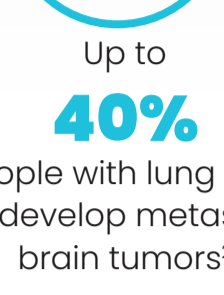
The brain and the spinal cord make up the central nervous system (CNS). Tumors located in these areas of the body are referred to as CNS tumors. They may be benign (not cancer) or malignant (cancer) and are divided into primary (tumors that originate in the brain or spinal cord) and metastatic (tumors that start in another part of the body and spread to the brain or spinal cord). Brain metastases occur more frequently than primary brain tumors and are most commonly caused by breast, colon, kidney, lung and skin (melanoma) cancer.



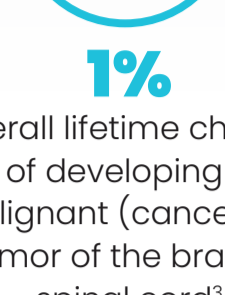
### CNS tumors are rare.



**308,000** new cases globally in 2020<sup>1</sup>



Up to **40%** of people with lung cancer will develop metastatic brain tumors<sup>2</sup>



**1%** overall lifetime chance of developing a malignant (cancerous) tumor of the brain or spinal cord<sup>3</sup>

## SECOND MOST COMMON CHILDHOOD CANCER

27% of cancer in children younger than 15<sup>4</sup>

## KNOW YOUR RISK

The cause of most CNS tumors is unknown. However, several factors may increase the risk of developing primary CNS tumors including:



### AGE

Children and older adults are more likely to develop CNS tumors.



### FAMILY HISTORY

Most people with CNS tumors do not have a related family history, although there are several hereditary genetic conditions (including Von Hippel-Lindau disease and neurofibromatosis or NF2) that are linked to a higher risk of CNS tumors.



### HEAD INJURIES

Some studies suggest a link between serious head trauma and CNS tumors like meningioma.



### WEAKENED IMMUNE SYSTEM

A weakened or compromised immune system increases the risk of primary CNS lymphomas (lymphomas of the brain or spinal cord).



### CARCINOGENIC SUBSTANCES

Repeated exposure to known carcinogens — at work or at home — may increase the risk of CNS tumors. Some studies suggest that nitrites or nitrates found in some cured meats, cigarette smoke and cosmetics may be linked with higher risk of CNS cancers.



### INFECTIOUS PATHOGENS

Infection with the Epstein-Barr virus — the virus that causes infectious mononucleosis — increases the risk of CNS lymphoma.

## KNOW THE SIGNS OR SYMPTOMS OF CNS TUMORS

CNS tumors can cause a very wide range of signs and symptoms, depending on the location, size and growth rate of the cancer. Some symptoms develop gradually, while others come on suddenly. In general, some of the most common symptoms of CNS tumors include:

- **Headache**
- **Nausea and/or vomiting**
- **Blurred vision**
- **Hearing loss**
- **Balance or coordination problems (including trouble walking)**
- **Personality or behavior changes**
- **Seizures**
- **Drowsiness**
- **Weakness or numbness in the arms or legs — often on just one side of body**
- **Bladder or bowel control problems**
- **Back pain or pain that spreads from the back towards the arms or legs**

**HEADACHES** occur in about **50%** of people with CNS tumors<sup>5</sup>

As many as **50%** of people with CNS tumors will have **SEIZURES** at some point<sup>6</sup>

## HOW ARE CNS TUMORS DIAGNOSED?



### Medical history and physical exam

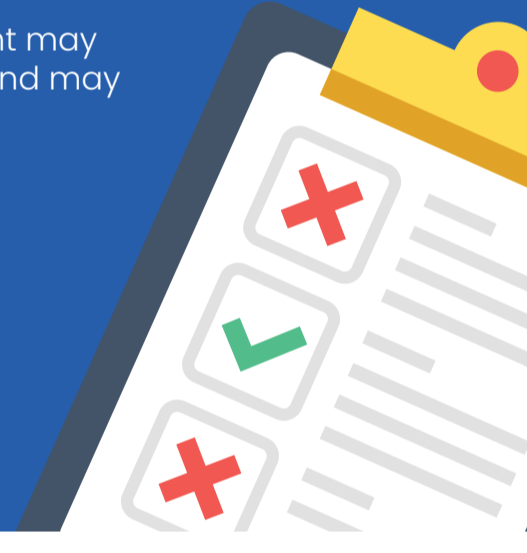
If signs or symptoms suggest you might have a brain or spinal cord tumor, your doctor will ask about your medical history, focusing on your symptoms and when they began. The doctor will also check your brain and spinal cord function by testing things like your reflexes, muscle strength, vision, eye and mouth movement, coordination, balance, and alertness.

If the results of the exam are abnormal, you may be referred to a neurologist (a doctor who specializes in medical treatment of nervous system diseases) and/or a neurosurgeon (a doctor who specializes in surgical treatment of nervous system disease), who will do a more detailed neurologic exam and may order other tests.

### DIAGNOSTIC TESTING

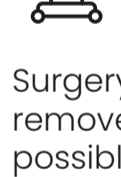
If physical examination presents abnormal results, a patient may be referred to a neurologist for a more thorough exam — and may additionally require one or more diagnostic tests:

- **Blood & urine analysis**
- **Imaging (X-ray, CT, PET, MRI or fMRI)**
- **Spinal tap**
- **Biopsy**



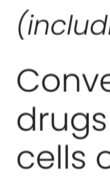
## WHAT ARE THE TREATMENT OPTIONS?

Today there are more options than ever for effectively treating CNS tumors. Medical care teams often use multiple treatment modalities to achieve the best outcome for the patient. The “best” option for each patient depends on the type of cell in which the tumor began, where the tumor is located and the stage or grade of cancer, as well as the patient’s age, lifestyle and overall health.



### SURGERY

Surgery may be performed to remove as much of the tumor as possible, or to help manage the symptoms resulting from the tumor. Following the procedure, some patients may be given radiation therapy or chemotherapy to kill any remaining cancer cells.



### CHEMOTHERAPY

(including Targeted Therapy)

Conventional chemotherapy uses drugs to kill rapidly growing cancer cells or stop them from dividing. Targeted therapy uses drugs that target the specific genes or proteins — blocking the growth and spread of the tumor cells.



### IMMUNOTHERAPY

Medicines that aid the body’s natural defenses in identifying and fighting cancer cells.



### RADIATION THERAPY

External beam radiation uses a machine outside the body to direct high-energy x-rays to kill, shrink or control the growth of tumors.



## RADIATION THERAPY IMPROVES WHAT’S POSSIBLE IN CNS TUMOR TREATMENT

The precision of surgical intervention can improve outcomes for many brain and spinal tumors, but there are many cases where surgical intervention may not be possible — or simply may not be the best option available. Fortunately, several advanced forms of radiation therapy are offering promising treatment options with proven outcomes for a wide range of CNS tumors.



### INTENSITY-MODULATED RADIATION THERAPY (IMRT)

IMRT is a specialized form of external beam radiotherapy that uses sophisticated beam-sculpting technology to vary the intensity of each radiation beam. IMRT enables clinicians to modulate the intensity of the radiation beams to fit the contours of the tumor more accurately and precisely — so the intense or higher doses are directed at the tumor — and help minimize dose to surrounding organs and tissues.



### STEREOTACTIC RADIOSURGERY (SRS) AND STEREOTACTIC BODY RADIATION THERAPY (SBRT)

Radiosurgery is a form of radiotherapy that uses precisely targeted high doses of radiation to destroy tumors. Radiosurgery is non-invasive; there is no incision involved. SRS and SBRT couple a high degree of targeting accuracy with very high doses of extremely precise, externally delivered radiation, thereby maximizing the cell-killing effect on the tumor(s) while minimizing the dose to nearby healthy tissue. SRS is used to treat conditions within the brain, while SBRT is commonly used to treat tumors outside the brain.

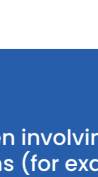
### ADVANTAGES OF MODERN RADIATION THERAPY

- Radiation treatments are non-surgical, non-invasive and typically pain-free
- No hospitalization or long recovery period for most patients
- Good tumor control
- Ideal option when more invasive techniques are deemed inappropriate or too risky
- Most patients can continue normal activity throughout treatment
- Can be used before or after surgery
- Can be combined with chemotherapy treatments

Learn more about how Accuray is redefining what’s possible in the treatment of CNS cancer.

**CYBERKNIFE®**

**RADIXACT®**



### Important Safety Statement:

Most side effects of radiotherapy, including radiotherapy delivered with Accuray systems, are mild and temporary, often involving fatigue, nausea, and skin irritation. Side effects can be severe, however, leading to pain, alterations in normal body functions (for example, urinary or salivary function), deterioration of quality of life, permanent injury and even death. Side effects can occur during or shortly after radiation treatment or in the months and years following radiation. The nature and severity of side effects depend on many factors, including the size and location of the treated tumor, the treatment technique (for example, the radiation dose), the patient’s general medical condition, to name a few. For more details about the side effects of your radiation therapy, and if treatment with an Accuray product is right for you, ask your doctor.

Sources:

- 1 ACS Journals, <https://acsjournals.onlinelibrary.wiley.com/doi/10.3322/caac.21660>, accessed August 12, 2021.
- 2 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3728058/>, accessed August 12, 2021.
- 3 American Cancer Society, <https://www.cancer.org/cancer/brain-spinal-cord-tumors-adults/about/key-statistics.html>, accessed August 12, 2021.
- 4 Cancer.net, <https://www.cancer.net/cancer-types/central-nervous-system-tumors-brain-and-spinal-cord-childhood/statistics>, accessed August 12, 2021.
- 5 American Cancer Society, <https://www.cancer.org/cancer/brain-spinal-cord-tumors-adults/detection-diagnosis-staging/signs-and-symptoms.html#:~:text=Headaches%20that%20tend%20to%20get,on%20where%20the%20tumor%20is>, accessed August 12, 2021.
- 6 American Cancer Society, <https://www.cancer.org/cancer/brain-spinal-cord-tumors-adults/detection-diagnosis-staging/signs-and-symptoms.html#:~:text=Headaches%20that%20tend%20to%20get,on%20where%20the%20tumor%20is>, accessed August 12, 2021.