Brain Tumors: Adult – Speech Therapy

Indexing Metadata/Description

› **Title/condition:** Brain Tumors: Adult – Speech Therapy
› **Synonyms:** CNS tumors; embryonal neoplasms; glioblastoma multiforme; gliomas; germ cell tumors; hemopoietic neoplasms; meningeal neoplasms; miscellaneous nongliarial neoplasms; neuronal/glioneuronal neoplasms; pineal parenchymal tumors; primary brain tumors; tumors, brain: adult – speech therapy
› **Anatomical location/body part affected:** The brain
› **Area(s) of specialty:** Adult Neurological Disorders
› **Description:** Brain tumors are abnormal masses within the intracranial space that can be benign or malignant. Primary brain tumors do not result from metastatic disease; a “secondary” brain tumor is a metastatic lesion from another type of primary cancer (e.g., lung cancer, breast cancer). Brain tumors can affect the brain tissue, meninges, pituitary gland, or blood vessels.

› **ICD-10 codes**
  • C70.0 malignant neoplasm of cerebral meninges
  • C70.1 malignant neoplasm of spinal meninges
  • C70.9 malignant neoplasm of meninges, unspecified
  • C71.0 malignant neoplasm of cerebrum, except lobes and ventricles
  • C71.1 malignant neoplasm of frontal lobe
  • C71.2 malignant neoplasm of temporal lobe
  • C71.3 malignant neoplasm of parietal lobe
  • C71.4 malignant neoplasm of occipital lobe
  • C71.5 malignant neoplasm of cerebral ventricle
  • C71.6 malignant neoplasm of cerebellum
  • C71.7 malignant neoplasm of brain stem
  • C71.8 malignant neoplasm of overlapping sites of brain
  • C71.9 malignant neoplasm of brain, unspecified
  • C75.1 pituitary gland
  • C75.2 craniopharyngeal duct
  • C75.3 pineal gland
  • C72.9 malignant neoplasm of central nervous system, unspecified
  • C79.31 secondary malignant neoplasm of brain
  • C79.32 secondary malignant neoplasm of cerebral meninges
  • C79.40 secondary malignant neoplasm of unspecified part of nervous system
  • C79.49 secondary malignant neoplasm of other parts of nervous system
  • CNS lymphoma
    – C82.0 small cleaved cell, follicular
    – C82.1 mixed small cleaved and large cell, follicular
    – C82.2 large cell, follicular
    – C82.7 other types of follicular non-Hodgkin's lymphoma
    – C82.9 follicular non-Hodgkin's lymphoma, unspecified
    – C83.0 small cell (diffuse)
    – C83.1 small cleaved cell (diffuse)
–C83.2 mixed small and large cell (diffuse)
–C83.3 large cell (diffuse)
–C83.4 immunoblastic (diffuse)
–C83.5 lymphoblastic (diffuse)
–C83.6 undifferentiated (diffuse)
–C83.7 Burkitt’s tumour
–C83.8 other types of diffuse non-Hodgkin’s lymphoma
–C83.9 diffuse non-Hodgkin’s lymphoma, unspecified
–C85.1 B-cell lymphoma, unspecified
–C85.7 other specified types of non-Hodgkin’s lymphoma
–C85.9 non-Hodgkin’s lymphoma, unspecified type
–B21.1 HIV disease resulting in Burkitt’s lymphoma
–B21.2 HIV disease resulting in other types of non-Hodgkin’s lymphoma
• D33.0 benign neoplasm of brain, supratentorial
• D33.1 benign neoplasm of brain, infratentorial
• D33.2 benign neoplasm of brain, unspecified
• D33.3 benign neoplasm of cranial nerves
• D33.4 benign neoplasm of spinal cord
• D33.7 benign neoplasm of other specified parts of central nervous system
• D33.9 benign neoplasm of central nervous system, unspecified
• D32.0 benign neoplasm of cerebral meninges
• D32.1 benign neoplasm of spinal meninges
• D32.9 benign neoplasm of meninges, unspecified
• D35.2 benign neoplasm of pituitary gland
• D35.3 benign neoplasm of craniopharyngeal duct
• D35.4 benign neoplasm of pineal gland
• D43.0 neoplasm of uncertain behavior of brain, supratentorial
• D43.1 neoplasm of uncertain behavior of brain, infratentorial
• D43.2 neoplasm of uncertain behavior of brain, unspecified
• D43.3 neoplasm of uncertain behavior of cranial nerves
• D43.7 neoplasm of uncertain behavior of other parts of central nervous system
• D43.9 neoplasm of uncertain behavior of central nervous system, unspecified
• D42.0 neoplasm of uncertain behavior of cerebral meninges
• D42.1 neoplasm of uncertain behavior of spinal meninges
• D42.9 neoplasm of uncertain behavior of meninges, unspecified
• D44.3 neoplasm of uncertain behavior of pituitary gland
• D44.4 neoplasm of uncertain behavior of craniopharyngeal duct
• D44.5 neoplasm of uncertain behavior of pineal gland
• D47.9 neoplasm of uncertain behavior of lymphoid, haematopoietic and related tissue, unspecified

(ICD codes are provided for the reader’s reference, not for billing purposes)

G-Codes

• Motor Speech G-code set
  –G8999, Motor speech functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  –G9186, Motor speech functional limitation, projected goal status at initial therapy treatment/outset and at discharge from therapy
  –G9158, Motor speech functional limitation, discharge status at discharge from therapy/end of reporting on limitation

• Spoken Language Comprehension G-code set
  –G9159, Spoken language comprehension functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  –G9160, Spoken language comprehension functional limitation, projected goal status at initial therapy treatment/outset and at discharge from therapy
• Spoken Language Expressive G-code set
  – G9162, Spoken language expression functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  – G9163, Spoken language expression functional limitation, projected goal status at initial therapy treatment/episode outset and at discharge from therapy
  – G9164, Spoken language expression functional limitation, discharge status at discharge from therapy/end of reporting on limitation

• Attention G-code set
  – G9165, Attention functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  – G9166, Attention functional limitation, projected goal status at initial therapy treatment/episode outset and at discharge from therapy
  – G9167, Attention functional limitation, discharge status at discharge from therapy/end of reporting on limitation

• Memory G-code set
  – G9168, Memory functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  – G9169, Memory functional limitation, projected goal status at initial therapy treatment/episode outset and at discharge from therapy
  – G9170, Memory functional limitation, discharge status at discharge from therapy/end of reporting on limitation

• Voice G-code set
  – G9171, Voice functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  – G9172, Voice functional limitation, projected goal status at initial therapy treatment/episode outset and at discharge from therapy
  – G9173, Voice functional limitation, discharge status at discharge from therapy/end of reporting on limitation

• Other Speech Language Pathology G-code set
  – G9174, Other speech language pathology functional limitation, current status at time of initial therapy treatment/episode outset and reporting intervals
  – G9175, Other speech language pathology functional limitation, projected goal status at initial therapy treatment/episode outset and at discharge from therapy
  – G9176, Other speech language pathology functional limitation, discharge status at discharge from therapy/end of reporting on limitation

<table>
<thead>
<tr>
<th>G-code Modifier</th>
<th>Impairment Limitation Restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH</td>
<td>0 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CI</td>
<td>At least 1 percent but less than 20 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CJ</td>
<td>At least 20 percent but less than 40 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CK</td>
<td>At least 40 percent but less than 60 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CL</td>
<td>At least 60 percent but less than 80 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CM</td>
<td>At least 80 percent but less than 100 percent impaired, limited or restricted</td>
</tr>
<tr>
<td>CN</td>
<td>100 percent impaired, limited or restricted</td>
</tr>
</tbody>
</table>

Source: http://www.cms.gov
Reimbursement: Reimbursement for therapy will depend on insurance contract coverage; no specific issues or information regarding reimbursement has been identified.

Presentation/signs and symptoms: Patients most often present with a headache as the initial symptom.\(^{(1,2,3-40)}\)

Additionally, patients might experience seizures; vomiting; slowly progressing motor, visual, or sensory deficits; muscle weakness; language disorder; and/or personality changes.\(^{(1,2,3-4)}\)

Brain tumors cause different types of speech, language, and cognitive-linguistic deficits depending on their location in the brain. The following is a description of deficits associated with specific tumor sites:

- **Frontal lobe**
  - Progressive intellectual decline/dementia\(^{(5)}\)
  - Memory impairment\(^{(6)}\) (for detailed information on assessment and treatment of memory deficits, see Clinical Review...Memory Impairment: Speech Therapy; CINAHL Topic ID Number: T708911)
  - Reduced executive functioning\(^{(5,2-8)}\)
  - Expressive aphasia\(^{(3,5,7,9)}\) (for detailed information on assessment and treatment of expressive aphasia, see Clinical Review...Aphasia, Broca's (Nonfluent Aphasia); CINAHL Topic ID Number: T708882)
  - Anosognosia (unawareness of deficits)\(^{(7)}\) (for detailed information on assessment and treatment of anosognosia, see Clinical Review...Anosognosia; CINAHL Topic ID Number: T708764)
  - Depression\(^{(8)}\)
    - For detailed information about depression, see the series of Clinical Reviews on this topic
  - Disinhibition/personality changes\(^{(5,7,8)}\)
  - Reasoning deficits\(^{(8)}\)

- **Temporal lobe**
  - Auditory hallucinations\(^{(5,7,8)}\)
  - Anomia\(^{(5)}\) (for detailed information on assessment and treatment of anomia, see Clinical Review...Anomia Associated with Aphasia; CINAHL Topic ID Number: T708611)
  - Behavioral changes\(^{(5)}\)
  - Emotional changes/anxiety/depression\(^{(5,8)}\)
  - Impaired memory\(^{(7,8)}\) (for detailed information on assessment and treatment of memory deficits, see Clinical Review...Memory Impairment: Speech Therapy, referenced above)
  - Impairments of attention (sustained, divided, or selective)\(^{(5)}\)
  - Personality changes\(^{(5,8)}\)
  - Receptive aphasia\(^{(3,7-8)}\) (for detailed information on assessment and treatment of receptive aphasia, see Clinical Review...Aphasia, Wernicke's (Receptive Aphasia, Fluent Aphasia); CINAHL Topic ID Number: T708883)
  - Seizures with olfactory or gustatory hallucinations\(^{(5)}\)
  - Visual field changes\(^{(5)}\)

- **Parietal lobe**
  - Acalculia\(^{(8)}\) (for detailed information on assessment and treatment of acalculia, see Clinical Review...Acalculia, Acquired; CINAHL Topic ID Number: T709249)
  - Acquired dyslexia\(^{(2,8)}\) (for detailed information on assessment and treatment of acquired dyslexia, see the series of Clinical Reviews on this topic)
  - Agnosia\(^{(5,7,8)}\) (for detailed information on assessment and treatment of agnosia, see Clinical Review...Agnosia; CINAHL Topic ID Number: T708855)
  - Agraphia\(^{(7,8)}\) (for detailed information on assessment and treatment of agraphia, see Clinical Review...Agraphia: Speech Therapy; CINAHL Topic ID Number: T708854)
  - Apraxia\(^{(2)}\) (for detailed information on assessment and treatment of apraxia, see the series of Clinical Reviews on this topic)
  - Aphasia\(^{(2)}\) (for detailed information on assessment and treatment of aphasia, see the series of Clinical Reviews on this topic)
Gerstmann syndrome – a combination of alexia, agraphia, acalculia, right-left confusion, and finger agnosia

Sensory seizures

Occipital lobe

Acquired dyslexia (for detailed information on assessment and treatment of acquired dyslexia, see the series of Clinical Reviews on this topic)

Balint’s syndrome – a combination of simultagnosia, optic ataxia, and ocular apraxia

Visual agnosias

Visual deficits

Brainstem and cerebellum

Ataxia (for detailed information on assessment and treatment of ataxia, see Clinical Review... Ataxia in Adults; CINAHL Topic ID Number: T708933)

Dysphagia (for detailed information on assessment and treatment of dysphagia, see the series of Clinical Reviews on this topic)

Right hemisphere versus left hemisphere: communication deficits vary depending on the part of the brain that is affected by the tumor, but also depending on whether the tumor is in the right or left hemisphere of the brain. Deficits associated with left hemisphere brain damage typically include speech and language impairments such as aphasia, agraphia, apraxia, and alexia. When brain damage occurs in the right hemisphere, this typically leads to cognitive deficits such as visual spatial neglect, attention deficits, memory impairments, executive dysfunction, reduced problem solving, poor reasoning, impaired organization, reduced planning, and poor self-awareness.

Causes, Pathogenesis, & Risk Factors

Causes: The etiology of most brain tumors is unknown. Research has been able to identify genetic abnormalities that might be responsible for certain types of astrocytoma brain tumors. Cell phone use is considered a possible cause of brain tumors; however, the evidence is inconclusive. Gliomas, meningiomas, and nerve sheath tumors have been linked to high levels of ionizing radiation.

Pathogenesis: The symptoms of brain tumor result from increased intracranial pressure or mass effect on the brain. The rate of growth of the brain tumor cells depends on the type of brain tumor. Gliomas, including glioblastoma multiforme (GBM), are the most aggressive types of brain tumor, followed by astrocytomas.

Risk factors

Age (65+)

Exposure to ionizing radiation

Sex (male > female; except for meningiomas, female > male)

Genetics/hereditary syndromes

History of cancer

Overall Contraindications/Precautions

Brain tumors increase intracranial pressure. In some cases, this increased intracranial pressure can lead to herniation syndromes (when brain tissue, cerebrospinal fluid, and blood vessels are moved or pressed away from their normal position within the skull)

The most common syndrome is herniation of the temporal lobe

The earliest sign of this type of herniation is ipsilateral pupillary dilation (dilation of the pupil on the same side as herniation)

In herniation of the temporal lobe the symptoms that follow are stupor, coma, decerebrate posturing (rigid extension of the arms and legs, downward pointing of the toes, and backward arching of the head), and respiratory arrest

If ipsilateral pupillary dilation is noted during examination or treatment, send the patient to the ER immediately

See specific Contraindications/precautions to examination and Contraindications/precautions under Assessment/Plan of Care
Examination

Contraindications/precautions to examination
• Patients with brain tumors often experience memory and concentration difficulties as well as fatigue. Clinicians must be sensitive to these potential limitations, and a full speech-language-cognitive assessment may require several sessions to complete.(6) The patient’s family member or caregiver should be present during the evaluation.
• During the evaluation, it is of utmost importance to be aware of a patient’s pain tolerance, level of fatigue, and level of frustration. The time of day and the number of previous evaluations can affect the patient’s alertness and performance. A patient’s culture and native language should also be considered to determine the appropriateness of examination questions and materials.
• Patients with a brain tumor might not be able to complete standardized tests or answer questions regarding medical history. It recommended that the caregiver/family be involved in all assessment procedures.

History

- History of present illness/injury
  - Mechanism of injury or etiology of illness: When was the brain tumor diagnosed? - What were the initial signs and symptoms associated with the tumor? Have any signs or symptoms improved or worsened since onset? What is the prognosis? - Review neurological testing and physician reports for information on the site and size of the tumor.
  - Course of treatment
    - Medical management: Treatment will depend on the type and site of the brain tumor, as well as the presenting symptoms. (1,2,3,4,5) The National Comprehensive Cancer Network guidelines for treatment of CNS cancers provide algorithms for oncologists to utilize when determining the best possible course of treatment for an individual patient.(39)
      Medical treatments include:
      - Anticonvulsant/antiseizure medications(2,3,8)
      - Surgical removal/excision/debulking of the tumor(1,2,3,4,5)
      - Radiation therapy(1,2,4,5)
      - Chemotherapy(1,2,3,4,5,8)
      - Corticosteroids (to reduce swelling in the brain)(2,3,4,5,8)
    - Medications for current illness/injury: Determine what medications physician has prescribed; are they being taken? Obtain a list of the medication side effects to determine if patient is experiencing them. Common medications for patients with brain tumors include:
      - Analgesics (for pain) such as codeine(3)
      - Anticonvulsants – such as phenytoin, fosphenytoin, and levetiracetam(2,3,8)
      - Chemotherapy such as carmustine, cisplatin, and lomustine(1,2,3,4,5,8)
      - Corticosteroids such as dexamethasone(2,3,4,5,8)
      - Histamine-receptor antagonists such as cimetidine, famotidine, and ranitidine(3)
    - Diagnostic tests completed: Note the results of any neurological (MRI, CT scan), blood, neuropsychological, or psychological/cognitive tests that have been completed.
      - Exact diagnosis and staging of brain tumors can only be accomplished though histologic examination of the tumor following biopsy or excision(2)
      - Dynamic contrast-enhanced MRI is sometimes used to assess tumor vascularity, which helps to develop a prognosis for treatment(41)
    - Home remedies/alternative therapies: Document any use of home remedies or alternative therapies (e.g., acupuncture) and whether they help.
    - Previous therapy: Document whether patient has had speech, occupational, or physical therapy for this or other conditions and what specific treatments were helpful or not helpful.
- Aggravating/easing factors
  - Does the patient do better in certain environments?
  - Do certain circumstances (e.g., busy restaurant, public places) aggravate the patient’s cognitive symptoms?
  - Is the patient aware of communication difficulties? Is the patient frustrated by communication difficulties?
- Does the patient have a mood disorder (e.g., depression) that might affect motivation to communicate? (10)

- **Nature of symptoms:** Document nature of symptoms (e.g., constant vs. intermittent, sharp, dull, aching, burning, numbness, tingling), which might include headache, seizures, vomiting, and motor, visual, or sensory deficits. (1, 3, 4)

- See **Presenting signs/symptoms**, above, for a list of symptoms commonly associated with brain tumors

- **Rating of symptoms:** Use a visual analog scale (VAS) or 0–10 scale to assess symptoms at their best, at their worst, and at the moment (specifically address if pain is present now and how much)

- **Pattern of symptoms:** Document changes in symptoms throughout the day and night, if any (a.m., mid-day, p.m., night); also document changes in symptoms due to weather or other external variables

- **Sleep disturbance:** Document number of wakings/night

- **Other symptoms:** Document other symptoms the patient is experiencing that could exacerbate the condition and/or symptoms that could be indicative of a need to refer to physician (e.g., ipsilateral pupillary dilation, dizziness, bowel/bladder/sexual dysfunction, saddle anesthesia)

- **Respiratory status:** Does the patient require supplemental oxygen? Nasal cannula? Does the patient have a tracheostomy tube? Does the patient require ventilator support?

- **Psychosocial status:** Depression and anxiety are common among patients with brain tumors. (8) It is important that speech-language pathologists (SLPs) be knowledgeable of symptoms of depression (e.g., loss of interest in daily activities, problems sleeping, feelings of sadness and hopelessness) and refer to a neuropsychologist or a clinical psychologist when such symptoms are present. (10) When a patient with a brain tumor has aphasia, assessment of depression and anxiety can be difficult; however, many depression scales and psychological scales have been used to assess patients who have aphasia. The SLP can collaborate with the psychologist to determine the appropriate evaluation with respect to the patient’s language abilities. (11) For detailed information about assessment and treatment of aphasia, see the series of Clinical Reviews on this topic. Examples include:
  - Hospital Anxiety and Depression Scale (HADS) (mild aphasia) (11)
  - Depression Intensity Scale Circles (DISC) (moderate aphasia) (11)
  - Stroke Aphasic Depression Questionnaire (severe aphasia – to be completed by caregiver) (11)
  - Visual Analogue Self-Esteem Scale (VASES) (12)

- **Hearing:** Document hearing ability
  - Does the patient have a known hearing loss? If so, does he or she wearing hearing aids or cochlear implants? Left, right, or bilateral? Are they available to the patient and in working order?
  - Refer to audiologist for full audiological evaluation if hearing impairment is suspected

- **Barriers to learning**
  - Are there any barriers to learning? Yes__ No__
  - If Yes, describe __________________________

**Medical history**

- **Past medical history**
  - **Previous history of same/similar diagnosis:** Does the patient have another type of cancer or history of cancer/brain tumor? Has the patient had a previous brain injury, stroke, or brain infection? Did the patient have a premorbid communication disorder such as agnosia, aphasia, apraxia, anomia, or dementia?
  - **Comorbid diagnoses:** Ask the patient or family/caregiver about other problems, including depression, diabetes, heart disease, complications of pregnancy, psychiatric disorders, and orthopedic disorders
  - **Medications previously prescribed:** Obtain a comprehensive list of medications prescribed and/or being taken (including OTC drugs)
  - **Other symptoms:** Ask the patient or family/caregiver about other symptoms the patient is experiencing. For patients with brain tumors, symptoms or reports of depression, anxiety, or suicidal feelings should be taken seriously and referrals to psychologist or psychiatrist should be made immediately. (8)

**Social/occupational history**

- **Patient’s goals:** Document what the patient and family/caregiver hope to accomplish with therapy and in general
- **Vocation/avocation and associated repetitive behaviors, if any:** Does the patient work or attend school?

**Functional limitations/assistance with ADLs/adaptive equipment**

- Document if the patient uses any adaptive equipment to communicate (e.g., pen/paper)
- Note if patient wears hearing aids, cochlear implants, or glasses
- Determine if adaptive equipment is in working order
- Note if patient uses any devices to assist with mobility (e.g., walker, wheelchair)

- **Living environment:** Stairs, number of floors in home, with whom patient lives (e.g., caregivers, family members).
  Identify if there are barriers to independence in the home; any modifications necessary? What is the level of noise and distractions in the patient’s living environment? Patients with brain tumor often require home modifications due to poor problem-solving skills and safety awareness.

**Relevant tests and measures:** (While tests and measures are listed in alphabetical order, sequencing should be appropriate to patient medical condition, functional status, and setting)

**• Arousal, attention, cognition (including memory, problem solving):** Cognitive impairments are the most common neurologic problems related to brain tumors. Patients with brain tumors sometimes have difficulty participating in speech, physical, or occupational therapy due to cognitive deficits such as impaired attention, short-term memory, problem solving, and judgment.

  - In a study conducted in France, researchers evaluated 10 patients with gliomas and compared their performance in 11 multimodal processing tasks to that of 60 healthy controls. Researchers found that, overall, the patients with gliomas were efficient in most of the tasks presented. Compared to the control group, the patients with gliomas experienced difficulty in a productive picture-naming task (requiring processing speed and word-finding), a receptive verbal judgment task (requiring auditory processing and executive functioning), and the visual/graphic portion of a dual-attention task (requiring simultaneous visual and verbal attention skills).

  - It is important to establish the patient’s areas of cognitive deficit in order to develop a proper treatment plan. The results of these tests may also assist the patient’s PTs and OTs in planning their own treatment sessions. Cognitive tests commonly used for assessing patients with brain tumor include:
  - Karnofsky Performance Scale Index – classifies patients according to their functional impairment on a scale of 0 (Dead) to 100 (Normal). This can be used to compare the effectiveness of different therapies and to assess the prognosis in individual patients; the lower the Karnofsky score, the worse the survival rate
  - Neurobehavioral Cognitive Status Examination – to assess orientation, attention, auditory and visual memory, spatial perceptual skills, calculations, and reasoning; skills are scored separately so specific deficits can be identified
  - Mini-Mental State Examination (MMSE) – to assess overall cognitive impairment; sections include Orientation to Time, Orientation to Place, Registration, Attention and Calculation, Recall, Naming, Repetition, Comprehension, Reading, Writing, Drawing

**• Assistive and adaptive devices:** Assess need for and ability to use augmentative and alternative communication (AAC)
  - For detailed information on assessment and treatment using AAC for patients with aphasia, see *Clinical Review…Augmentative and Alternative Communication: Aphasia*; CINAHL Topic ID Number: T709145

**• Oral structure and oral motor function:** Complete a full oral mechanism exam. The patient may have reduced lingual, labial, and velar strength, ROM, and rate. Patients with brain tumors can have dysarthria or apraxia. For detailed information about dysarthria and apraxia, please see the series of Clinical Reviews on these topics.

**• Perception (e.g., visual field, spatial relations):** Vision and hearing must be thoroughly examined in patients with brain tumors. An audiologist should complete a full audiological evaluation. An ophthalmologist should complete a full visual examination. If during the exam it appears the patient has altered perception, refer to audiology, ophthalmology, or neurology for further testing.

**• Sensation:** Patients with brain tumors may experience deficits in sensation. Informal tests for sensation include normal touch, light touch, pinprick, position sensation, vibration, and temperature. An occupational therapy evaluation might include more extensive testing for touch sensation; review available reports regarding sensory deficits prior to evaluation.

**• Speech and language examination (including reading):** A complete and detailed evaluation of communication skills is necessary in patients with brain tumor. Several sessions might be required to complete the initial evaluation so that a proper treatment program can be developed. When selecting tests for communication assessment, clinicians must consider the cultural and linguistic backgrounds of the patient and determine if the measurement was standardized on the relevant population. Tests that have normative information on diverse groups should be used when possible.

  - Speech: A motor speech evaluation should be performed to identify or rule out apraxia and/or dysarthria
  - For detailed information on assessment and treatment of apraxia, see *Clinical Review…Apraxia of Speech (Acquired)*; CINAHL Topic ID Number: T708586. For detailed information on assessment and treatment of dysarthria (spastic, flaccid, ataxic, hypokinetic, and hyperkinetic), see the series of Clinical Reviews on dysarthria.
Brain tumors (especially those in the left hemisphere) often result in language impairment; assess both receptive and expressive language skills.\textsuperscript{(14-17)}

- In a retrospective study conducted in the United States of 65 patients who underwent craniotomy for resection of a malignant left hemisphere brain tumor, researchers found that the type of aphasia most common among these patients was mild anomic aphasia.\textsuperscript{(14)}

- In a prospective study conducted in Italy with 19 patients with gliomas in the ventrolateral aspect of the dominant (left) frontal lobe, researchers found that all patients in the study with high-grade gliomas (grade III or IV) exhibited mild or moderate aphasia and those with low-grade gliomas (grade I or II) had normal language function on the Aachen Aphasia Test (AAT). Additionally, the risk of language deficits was increased if the tumor involved the ventral precentral gyrus (versus the inferior frontal gyrus) with extension to the arcuate fasciculus.\textsuperscript{(31)}

- Standardized tests assess components of expressive and receptive language that are affected by aphasia, including word finding, auditory comprehension, reading, and writing. Many tests determine severity of aphasia, distinguish one type of aphasia from another, and provide guidance for remediation. Standardized language tests for aphasia include:
  - Boston Diagnostic Aphasia Examination (BDAE);\textsuperscript{(18)} to assess expressive and receptive language skills as well as visual-spatial and quantitative skills
  - Pyramids and Palm Trees Test;\textsuperscript{(19)} to assess a patient’s ability to access detailed semantic representations from words and from pictures
  - Psycholinguistic Assessments of Language Processing in Aphasia (PALPA);\textsuperscript{(20)} to assess all aspects of language through 60 subtests including expressive and receptive language and reading and writing
  - Western Aphasia Battery–Revised (WAB-R);\textsuperscript{(21)} to assess expressive and receptive language skills
  - Bilingual assessment (as needed)
  - In a study conducted in France of 2 bilingual patients with gliomas (1 in the temporal lobe, the other in the frontal lobe), researchers found that after tumor resection both patients developed isolated naming deficits in L1 (the first language that the patient acquired).\textsuperscript{(22)}
  - Bilingual Aphasia Test (BAT);\textsuperscript{(23)} assesses the bilingual patient’s ability to use each language in different settings by a language use history questionnaire. A computer program is available to evaluate responses in more than 100 different languages
  - For detailed information on assessment and treatment of bilingual adults with aphasia, see \textit{Clinical Review... Language Disorders: Aphasia in Bilingual Adults}; CINAHL Topic ID Number: T708880

- \textbf{Voice:} Dysphonia from vocal cord paralysis can result from tumors located in the brainstem (medulla oblongata).\textsuperscript{(24)}
  - Briefly assess vocal function, including vocal quality, loudness, pitch, and endurance; if there are specific concerns regarding voice, refer to otolaryngologist for complete workup to rule out laryngeal pathologies prior to completing a full evaluation
  - For detailed information on assessment and treatment of dysphonia due to vocal fold paralysis, see \textit{Clinical Review... Dysphonia: Unilateral Vocal Fold Paralysis in Adults}; CINAHL Topic ID Number: T709103

- \textbf{Reading/writing:} Assess reading and writing skills as part of a complete evaluation of aphasia; portions of standardized tests for aphasia provide standardized tests of both reading and writing

\begin{itemize}
  \item \textbf{Swallow examination:} Patients with brain tumor who have suspected dysphagia will require an examination of swallowing function. A clinical swallow examination (CSE) can be performed by the SLP initially; however, instrumental evaluations of swallowing (e.g., modified barium swallow study [MBSS] or fiberoptic endoscopic evaluation of swallowing [FEES]) might be required as a patient’s swallow function worsens with tumor progression. (For detailed information on assessment and treatment of dysphagia, see the series of Clinical Reviews on this topic)
  \item \textbf{Tracheostomy examination:} If present, assess tracheostomy tube and document date of placement, current respiratory status, and use of speaking valve. For detailed information on assessment of patients with tracheostomies, see \textit{Clinical Review...Dysphagia: Adults with Tracheostomy}; CINAHL Topic ID Number: T709084. For detailed information on assessment of a tracheostomy tube and use of a speaking valve, see \textit{Clinical Review...Passy-Muir Tracheostomy & Ventilator Swallowing and Speaking Valve}; CINAHL Topic ID Number: T708919
  \item \textbf{Special tests specific to diagnosis}
    \begin{itemize}
      \item \textbf{Quality of life}
        - Researchers in Australia developed a quality of life question prompt list with input from patients, caregivers, and healthcare professionals specifically for patients with brain tumors. In a nonrandomized pilot study, researchers found
that this questionnaire was acceptable to and valued by patients with brain tumors; however, further research is needed to determine validity and acceptability to caregivers and healthcare providers. The Short Form Health Survey (SF-36) is a generic health-related quality of life questionnaire that evaluates overall independence, emotional and mental health, limitations to previous roles, and social status.

Assessment/Plan of Care

› Contraindications/precautions
- Only those contraindications/precautions applicable to this diagnosis are mentioned below, including with regard to modalities. Rehabilitation professionals should always use their professional judgment.
- Patients with brain tumors are at risk for falls; follow facility protocols for fall prevention and post fall-prevention instructions at bedside, if inpatient. Ensure that patient and family/caregivers are aware of the potential for falls and educated about fall-prevention strategies. Discharge criteria should include independence with fall-prevention strategies.
- Patients with brain tumors often exhibit memory and concentration difficulties as well as fatigue. Clinicians must be sensitive to these potential limitations, and a full speech-language-cognitive assessment might require several sessions to complete.
- The relative risks and benefits of intensive therapy should be evaluated on a case-by-case basis. Individual therapy for patients with brain tumors will focus on remediation and compensatory strategy development for the patient’s specific speech, language, cognitive, or swallowing impairment(s). Treatment gains should be clearly documented.
- To ensure relevance and appropriateness of treatment programs, decisions about goals and course of therapy should be made in collaboration with the patient, the caregivers, and other healthcare professionals. Cultural background, language preference, occupation (if relevant), and patient interests must also be considered.
- Treatment goals and objectives will evolve throughout the intervention period.
- Patients with brain tumors are also at risk for swallowing and feeding difficulties. Ensure that the patient and family/caregivers are aware of potential aspiration risks and educated about prevention and compensatory strategies when appropriate.
- Clinicians should follow the guidelines of their clinic/hospital and what is ordered by the patient’s physician. The summary below is meant to serve as a guide, not to replace orders from a physician or a clinic’s specific protocols.

› Diagnosis/need for treatment: The diagnosis of a communication disorder in a patient with a brain tumor will depend on the results of the full speech, language, and cognitive evaluation. The patient might present with aphasia, anoma, apraxia, agraphia, alexia, acalculia, agnosia, anosognosia, dysarthria, or cognitive deficits in the areas of memory, problem solving, executive functioning, visual-spatial skills, judgment, reasoning, or safety awareness. The patient might also present with dysphagia. Each of the aforementioned test batteries will have specific criteria and test scores that are used to determine the presence and extent (i.e., mild, moderate, severe) of the cognitive and/or communication disorder. In most cases, patients with brain tumors present with multiple impairments. The need for treatment will be determined by the SLP, patient, and patient’s family and is based on the presence of a communicative, cognitive, or swallowing disorder, the patient’s potential ability to make improvements, and the patient or family’s desire to participate in the therapy program.

› Rule out: The patient’s medical team will rule out the following diagnoses before making a diagnosis of brain tumor:
- Abscess
- Demyelinating disease
- Primary CNS lymphoma
- Stroke

› Prognosis: The prognosis for benign brain tumors typically is good, as most tumors can be treated medically or surgically, relieving symptoms. In some cases, no treatment is indicated for benign brain tumors. In general, the prognosis for malignant brain tumors in adults is not favorable. The following factors appear to have an impact on the prognosis:
- Age (younger patients have a better prognosis than older patients)
- Duration of symptoms (patients who have experienced symptoms for a longer period of time have a worse prognosis than patients whose symptoms are very recent in onset)
- Functional performance at the time of diagnosis (patients with a current high level of function have a better prognosis than those who are low-functioning)
• Type of treatment

  – In a randomized controlled trial conducted in the United States with 251 patients who had been diagnosed with grade II gliomas, researchers reported that longer progression-free and overall survival was associated with combination of radiation plus chemotherapy versus radiation alone.

• Tumor histology

  – WHO developed a grading system that is based on the similarity of tumor cells to normal cells, the rate of the tumor growth, the presence of necrotic cells in the middle of the tumor, the presence of definitive tumor margins, and the vascularity of the tumor. Prognosis becomes less favorable as grade increases:
    - Grade I: most discrete; slow growing; can be cured by surgery alone
    - Grade II: also slow growing; have the ability to invade normal tissue and the potential to recur with a higher grade of malignancy
    - Grade III: have actively reproducing abnormal cells that can infiltrate adjacent normal cells
    - Grade IV: most malignant type of brain tumor; rapid proliferation and infiltration of adjacent tissues; central area of necrosis

• Type of tumor (gliomas are the most aggressive type of tumor, followed by astrocytoma; meningiomas are benign tumors that generally are managed and treated by surgery alone)

  – GBM is associated with extremely poor prognosis; survival rate one year after diagnosis is 35% and after 5 years is 5%.

› Referral to other disciplines: All patients with brain tumors should have a neurologist, neurosurgeon, and oncologist. If the patient does not have all of these physicians actively involved in his or her case, referrals should be made. Patients should be referred to physical and occupational therapy for evaluation and treatment. Patients with significant amounts of pain might benefit from a referral to palliative care. Referral to psychology, psychiatry, or neuropsychology should be made if the patient reports feelings of depression, hopelessness, or other emotional distress. Referral to ophthalmology should be made if patient appears to present with visual field cut or poor vision. Referral to audiology should be made if the patient presents with hearing loss.

› Other considerations: Patients with brain tumors are a heterogeneous group, and the treating therapist must be aware of this when determining an appropriate treatment plan. Patients who have very poor prognoses might be inappropriate for therapy as they are unlikely to make gains. Eventually, the functional status of patients with malignant brain tumors will decline, and an SLP’s role may shift throughout the course of treatment from providing aggressive therapy to providing supportive counseling.

› Treatment summary: Speech therapy for a patient with a brain tumor will focus on the patient’s current symptoms. As symptoms can fluctuate—improvement following medical intervention and deterioration as the brain tumor progresses—the treatment program will vary according to the patient’s needs. When a patient’s tumor and symptoms progress to a point that warrants palliative or hospice care only, speech therapy goals will focus on achieving the patient’s highest quality of life with respect to communication and swallowing prior to discharge.

• Cognitive rehabilitation program

  – Can involve working with the patient on drills and activities specifically designed to target areas of cognitive deficits. Often these activities require the patient to multitask and may target several deficits simultaneously. Activities might include:
    - Word puzzles
    - Books
    - Computer or board games
    - Restructuring: compensatory strategy that centers around adjusting the demands placed on the patient in order to promote success and safety
      - Teaching the patient to alter his or her expectations of him or herself; training the caregiver(s) to alter expectations of the patient’s abilities
      - Organizing the patient’s room or apartment to promote structure and routine
      - Involving the patient in activities that focus on his or her strengths rather than weaknesses

- In a 3-part study conducted in Australia, researchers examined 3 parts of a behavioral consultancy approach for patients with brain tumor

- The subject for part 1 of this study was a 57-year-old female patient with a right temporal grade II astrocytoma who had undergone surgical resection of the tumor and 6 weeks of radiation. The behaviors targeted for the intervention were social in nature: excessive talking with both familiar persons and strangers, poor turn-taking in conversations, repeated interruptions during conversation, and having a limited range of conversation topics. After patient/husband interviews and observations of the patient, the following measurable goals were set: to reduce the amount of time spent talking in a monologue in terms of minutes and seconds, to increase the number of questions, and to reduce the number of interruptions by the patient during conversations. Because these behaviors were exhibited most often (and were the most disruptive) in the support group of which this patient was a part, the baseline and postintervention observations were undertaken within these group meetings. The intervention, delivered in one 2-hour session by a clinical psychologist with 5 years’ experience in acquired brain injury, was divided into 3 parts: (1) providing education about the problem behaviors to both the patient and her husband based on the observations and initial assessments; (2) direct training in communication skills provided to the patient, which included brainstorming conversation topics and role-playing social situations; and (3) relaxation skills training. In the support group postintervention, the patient’s talking time was reduced from 71% to 14%, interruptions decreased from 0.5/minute to 0.15/minute, and questions increased from 0.05/minute to 0.12/minute

- In the second part of the study, researchers piloted a 3.5-hour workshop for 7 caregivers/family members of patients with brain tumors focused on compensatory strategies for managing behavioral and cognitive changes post brain tumor. During the workshop, caregivers/family members attended sessions together with the patients with brain tumors as well as separate sessions facilitated by the researchers. Outcomes were measured by the Strategy Use Measure (SUM), which is a tool developed to evaluate the knowledge and use of compensatory behavioral management strategies of caregivers/family members for individuals with acquired brain injury. At the conclusion of the workshop, the caregivers/family members demonstrated a significant increase in their SUM scores

- In part 3 of this study, researchers evaluated the impact of a 6-hour staff training workshop for 43 participants that focused on compensatory strategies for managing behavioral and cognitive changes in patients with brain tumor. At the conclusion of the workshop, participants demonstrated a significant increase in SUM scores compared to preworkshop

—Memory therapy
- Restoration therapy: The focus of restoration therapy for memory is to strengthen the patient’s memory through exercises. This can be accomplished through:
  - Spaced retrieval
  - Memory rehearsal
  - Auditory and visual memory tasks
  - For detailed information on assessment and treatment of memory deficits, see Clinical Review…Memory Loss: Speech Therapy, referenced above
- Compensatory memory strategies: Compensatory strategies for memory deficits are intended to compensate for the patient’s inability to remember important information including dates, medications, and appointments. Strategies include:
  - Use of a handheld electronic device or PDA
  - Use of a calendar
  - A memory book to include pictures of the patient’s family members, doctors, and therapists
  - Use of a notepad

—In an RCT conducted in the Netherlands of a cognitive rehabilitation program for 140 patients with gliomas, researchers demonstrated a positive effect on both short-term cognitive complaints and longer-term cognitive performance and mental fatigue

- The patients all had low-grade and anaplastic gliomas and favorable prognostic factors (such as Karnofsky score > 70 and clinical stability [no disease progression in the 6 months prior to the study])
- Patients were divided into two groups, one of which participated in a cognitive rehabilitation program. The cognitive rehabilitation program consisted of 6 individual sessions, one time per week for 2 hours each
- Therapy sessions were executed by a neuropsychologist
Focus of the training included cognitive retraining and compensatory strategy training; some of the cognitive activities were done through a computer program that focused on improving attention. Weekly homework assignments with a computer-based attention program were provided; patients were also asked to keep a daily log charting compensatory strategy use. Three months after the cognitive rehabilitation program concluded, the subjects had a telephone-based booster session. There were no statistically significant group differences in attention or verbal memory scores immediately post treatment; however, there was a significant increase in self-reported cognitive functioning in the experimental group. At a 6-month follow-up, there was significant improvement on combined tests for both attention and verbal memory in the experimental group, but not the control group; additionally, there were significantly better scores on mental fatigue test for the experimental group.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Goal</th>
<th>Intervention</th>
<th>Expected Progression</th>
<th>Home Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apraxia of speech (as needed)</td>
<td>Increase functional speech production</td>
<td>Apraxia therapy</td>
<td>Progression through therapy tasks will vary with respect to the goals of the patient</td>
<td>Home program will vary with respect to the goals of the patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For detailed information on assessment and treatment of apraxia, see the series of Clinical Reviews on this topic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquired dyslexia (as needed)</td>
<td>Increase functional reading ability</td>
<td>Acquired dyslexia therapy</td>
<td>Progression through therapy tasks will vary with respect to the goals of the patient</td>
<td>Home program will vary with respect to the goals of the patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For detailed information on assessment and treatment of acquired dyslexia, see the series of Clinical Reviews on this topic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acalculia (as needed)</td>
<td>Improve calculation and math skills</td>
<td>Acalculia therapy</td>
<td>Progression through therapy tasks will vary with respect to the goals of the patient</td>
<td>Home program will vary with respect to the goals of the patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For detailed information on assessment and treatment of acalculia, see Clinical Review... Acalculia, Acquired, referenced above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agnosia (as needed)</td>
<td>Increase ability to interpret sensory experiences</td>
<td>Agnosia therapy</td>
<td>Progression through therapy tasks will vary with respect to the goals of the patient</td>
<td>Home program will vary with respect to the goals of the patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For detailed information on assessment and treatment of agnosia, see Clinical Review... Agnosia, referenced above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>Goal</td>
<td>Therapy</td>
<td>Progression through therapy tasks will vary with respect to the goals of the patient</td>
<td>Home program will vary with respect to the goals of the patient</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------</td>
<td>------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td>Agraphia (as needed)</td>
<td>Increase functional writing abilities</td>
<td><strong>Agraphia therapy</strong>&lt;br&gt;For detailed information on assessment and treatment of agraphia, see <em>Clinical Review... Agraphia: Speech Therapy</em>, referenced above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anosognosia (as needed)</td>
<td>Increase deficit awareness</td>
<td><strong>Anosognosia therapy</strong>&lt;br&gt;For detailed information on assessment and treatment of anosognosia, see <em>Clinical Review... Anosognosia</em>, referenced above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dysarthria (as needed)</td>
<td>Increase functional speech production</td>
<td><strong>Dysarthria therapy</strong>&lt;br&gt;For detailed information on assessment and treatment of dysarthria, see the series of Clinical Reviews on this topic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dysphagia (as needed)</td>
<td>Increase swallow safety</td>
<td><strong>Dysphagia therapy</strong>&lt;br&gt;Therapy will vary according to the results of a swallow evaluation. Treatment may include strategies for airway protection, strategies for facilitating oral phase of swallowing, and dietary adjustments&lt;br&gt;For detailed information on assessment and treatment of dysphagia, see the series of Clinical Reviews on this topic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>Goal(s)</td>
<td>Intervention</td>
<td>Progression through therapy tasks will vary with respect to the goals of the patient</td>
<td>Home program will vary with respect to the goals of the patient</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Receptive aphasia (as needed)</td>
<td>Increase functional speech production</td>
<td><strong>Receptive aphasia therapy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>For detailed information on assessment and treatment of receptive aphasia, see Clinical Review...Aphasia, Wernicke’s (Receptive Aphasia; Fluent Aphasia), referenced above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expressive aphasia (as needed)</td>
<td>Increase functional speech production</td>
<td><strong>Expressive aphasia therapy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>For detailed information on assessment and treatment of expressive aphasia, see Clinical Review...Aphasia, Broca’s (Nonfluent Aphasia), referenced above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global cognitive impairment (including deficits of attention, concentration, organization, memory, problem-solving, judgment, safety awareness, and reasoning)</td>
<td>Increase the patient’s likelihood of success in his or her environment; increase the patient’s cognitive functioning</td>
<td><strong>Functional training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cognitive rehabilitation program</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restructuring</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compensatory strategies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Caregiver training and education</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Treatment summary, above</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced memory skills</td>
<td>Increase the patient’s functional memory</td>
<td>Functional training</td>
<td>When the patient correctly recalls target items, the SLP progresses the patient appropriately, requiring recall after increasingly longer periods of delay</td>
<td>None specified; however, therapist may provide simple exercises for patient to practice at home with family members or caregiver to improve Use of compensatory strategies at home is part of treatment plan</td>
</tr>
</tbody>
</table>

### Desired Outcomes/Outcome Measures

- The desired outcome of speech therapy for a patient with a brain tumor is for the patient to have usable, functional communication abilities
  - BDAE
  - Pyramids and Palm Trees Test
  - PALPA
  - WAB-R
- Improved quality of life
  - SF-36
- For patients who are relatively high functioning with a longer life expectancy, the goals of therapy might involve returning to school or work
- For patients dealing with end-of-life issues, the outcome of therapy might involve developing a method of communication to compose a will or express pain management needs
- For patients with dysphagia, the desired outcome of therapy is to have a functional swallow for the least restrictive diet; if a functional swallow is not a viable goal (due to the severity of dysphagia or progression of the brain tumor), the goal might be determining a safe means of providing nutrition, such as a feeding tube
  - CSE
  - MBSS/Videofluoroscopic swallow study (VFSS)
  - FEES

### Maintenance or Prevention

- Maintenance of skills for a patient with a brain tumor will depend on continued use of skills and compensatory strategies learned in therapy as well as progression of the tumor
- For treatments that involve drills, patients will be more likely to maintain progress made if they continue to utilize the home programs following discharge from therapy

### Patient Education

- In a pilot study conducted in Australia, researchers found that family and healthcare staff training programs were effective for managing cognitive and behavioral changes in patients with brain tumor; the SLP should provide education when appropriate about how to manage challenges in patients with brain tumor (e.g., reducing distractions, establishing routines, redirecting attention when necessary, identifying and avoiding triggers for challenging behaviors) \(^{(29)}\)
- American Brain Tumor Association, [http://www.abta.org](http://www.abta.org)
Note
Recent review of the literature has found no updated research evidence on this topic since previous publication on April 14, 2017

References

Coding Matrix
References are rated using the following codes, listed in order of strength:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Published meta-analysis</td>
</tr>
<tr>
<td>SR</td>
<td>Published systematic or integrative literature review</td>
</tr>
<tr>
<td>RCT</td>
<td>Published research (randomized controlled trial)</td>
</tr>
<tr>
<td>R</td>
<td>Published research (not randomized controlled trial)</td>
</tr>
<tr>
<td>C</td>
<td>Case histories, case studies</td>
</tr>
<tr>
<td>G</td>
<td>Published guidelines</td>
</tr>
<tr>
<td>RV</td>
<td>Published review of the literature</td>
</tr>
<tr>
<td>RU</td>
<td>Published research utilization report</td>
</tr>
<tr>
<td>GI</td>
<td>Published quality improvement report</td>
</tr>
<tr>
<td>QI</td>
<td>Published government report</td>
</tr>
<tr>
<td>PFR</td>
<td>Published funded report</td>
</tr>
<tr>
<td>X</td>
<td>Practice exemplars, stories, opinions</td>
</tr>
<tr>
<td>GI</td>
<td>General or background information/texts/reports</td>
</tr>
<tr>
<td>CP</td>
<td>Conference proceedings, abstracts, presentation</td>
</tr>
</tbody>
</table>


