Standard of Care: Craniotomy

Inpatient Occupational Therapy management of patients after neurosurgical intervention involving a craniotomy.

ICD-9:
- 191.9 Malignant neoplasm brain NOS
- 225.0 Benign neoplasm brain
- 239.6 Brain neoplasm NOS
- 324.0 Intracranial abscess
- 331.5 Idiopathic normal pressure hydrocephalus
- 348.5 Cerebral edema
- 348.9 Brain condition NOS
- 430.0 Subarachnoid hemorrhage
- 434.91 CVA
- 742.3 Congenital hydrocephalus
- 851.86 TBI
- 854.0 Intracranial injury of other/unspecified nature
- 905.0 Fracture / face, skull

Case Type / Diagnosis:
A craniotomy is performed when a surgical procedure to the brain is required. According to medical literature, it is defined as a surgical procedure to remove part of the skull to expose the brain.

While there is no direct research that explores the direct effects of a craniotomy on an individual’s performance skills, there is significant research that demonstrates changes with cognitive-behavioral and physical performance, as well as changes to an individual’s quality of life after brain surgery (Hannegan, 1989).

Occupational therapists are educated on the various diseases and processes that may require an individual to undergo a craniotomy. Occupational therapists are able to take into consideration an individual’s pre-hospital roles and assist in determining the likelihood of patient’s resumption in their roles and routines. In the acute care setting, the occupational therapist evaluates the patients and then provides the appropriate interventions and discharge recommendations to assist in returning to functional activities. Therefore, occupational therapists are an integral part of the team for individuals undergoing a craniotomy.

This standard of care applies to the acute care occupational therapy rehabilitation interventions for patients who have undergone a craniotomy at Brigham and Women’s Hospital.

Indications for Treatment:
Currently, all patients who have undergone a craniotomy at Brigham & Women’s Hospital are referred to occupational therapy for an evaluation. The primary indications for treatment include:
- Impaired ability to perform activities of daily living (ADL’s) such as feeding, grooming, bathing, dressing, toileting
• Impaired ability to perform instrumental activities of daily living (IADL’s) such as cooking, laundry, medication and home management
• Impaired ability to perform functional mobility/transfers
• Impaired knowledge regarding postoperative precautions as integrated into activities of daily living (ADL’s) and instrumental activities of daily living (IADL’s)
• Impaired cognition such as level of arousal, alertness, orientation, attention, memory, problem-solving, safety awareness, judgment, and executive functioning
• Impaired sensory-perceptual skills including diplopia, environmental/hemi-body attention, visual field loss, and impaired depth perception
• Impaired neuromusculoskeletal and movement related functions such as impaired upper extremity (UE) strength, active range of motion (AROM), passive range of motion (PROM), sensation, fine motor coordination, tone, and motor planning

**Contraindications:**
The following are common contraindications and precautions which may be encountered in the management of the patient who has undergone a craniotomy. Each encounter with a patient warrants careful re-examination of the patient’s chart for recent events as well as potential consultation with the patient’s nurse and/or doctor to discuss specific guidelines for occupational therapy intervention. These guidelines may vary from facility to facility.

• Elevated intracranial pressure (Normal intracranial pressure (ICP) range is 4-15mmHg); Check with nurse prior to intervention for ICP parameters
• Acute changes in neurological status, including altered mental status, new/worsening extremity weakness, facial weakness, sensory changes, vision changes, speech changes, new onset/worsening headache and/or seizure activity that requires further medical work-up or treatment
• Newly identified deep vein thrombosis (DVT) or pulmonary embolism (PE) that has yet to be treated appropriately with anticoagulation or placement of an inferior vena cava (IVC) filter
• New myocardial infarction (MI)
• New and/or active bleeding that requires further medical work-up or treatment
• Acute worsening in respiratory status
• Unstable vital signs or blood pressure measured out-side of MD parameters
• Cerebral angiography
  - Patients are on bed rest for 6-8 hours post-procedure with the hip and knee immobilized due to the presence of a femoral sheath
• Lumbar puncture
• Lumbar Drain/External Ventricular Drain (EVD) Precautions according to current BWH practice standards
  - Patients may be on bed rest and/or have HOB restrictions
  - RN must clamp drain prior to out-of-bed activity and it should never be clamped for longer than 30 minutes, unless ordered by the MD
  - The drain is leveled at the tragus. Do not adjust the height of the bed or mobilize the patient unless the drain has been clamped
  - Symptoms of intolerance to lumbar drainage may include headache, nausea, vomiting, weakness, and/or altered mental status. Clarify activity orders with MD if any of these symptoms are present
Precautions:
Activity orders are to be written in BICS by the MD or clarified with the physician prior to the initial occupational therapy evaluation.
The following precautions are based on current practice at Brigham and Women’s Hospital and may vary from facility to facility.

- Aspiration Precautions:
  - Head of bed should be kept greater than or equal to 30 degrees
  - Dietary restrictions/parameters to be followed as recommended by Speech and Swallow Service

- Cerebral aneurysm and vasospasm Precautions:
  - Avoid all situations which may increase intracranial pressure (ICP) while patient is in vasospasm or is at risk for vasospasm("Clinical practice manual," 2008)

- Craniectomy Precautions (maintained as long as bone flap is absent):
  - Craniotomy precautions PLUS helmet must be worn at all times when out of bed("Clinical practice manual," 2008)

- Craniotomy Precautions (maintained for two to four weeks following surgery or until cleared by neurosurgeon):
  - Avoid bending so that head is in a dependent position during functional activities
  - Head of bed elevated 30 degrees, use pillows at home
  - No vigorous exercise until cleared by physician
  - No driving until cleared by physician
  - No lifting of objects weighing greater than ten pounds

- Transphenoidal Craniotomy (“Nasal”) Precautions:
  - Head of bed should be elevated 30 degrees, use pillows at home
  - Avoid sneezing if at all possible
  - Do not blow nose
  - Notify physician if fluid is dripping or draining from nose or ears
  - Avoid bearing down (Valsalva maneuver)
  - Do not use straws

Evaluation / Assessment:

History of Present Illness (HPI): Describe the series of events leading to the hospitalization, date of onset, duration of symptoms, date of admission, and previous neurological diagnostic procedures.

Hospital Course (HC): Provide the date of admission, neurological diagnostic procedures, pertinent laboratory tests, and surgical or interventional radiology treatments/procedures.

Past Medical History (PMH): List all pertinent medical and surgical conditions highlighting oncology history (previous or ongoing chemotherapy or radiation), as well as baseline cognitive status.

Occupational Profile:
Obtain detailed social and environmental information from the chart and patient and or family interview on the following:

- Contextual issues that support or inhibit function in daily roles
• Home environment, environmental barriers, assistive devices, or adaptive equipment used at home
• Family and or caregivers involvement prior to admission and availability to assist upon discharge
• Prior functional level in ADL’s, IADL’s, leisure interests, vocational roles, and daily routines
• Patient’s goals and priorities for returning to daily occupations and life roles

**Analysis of Occupational Performance:**

**Client Factors:**
- Sensory functions and pain (hearing, seeing, vestibular, proprioceptive functions, analysis of pain)
- Values and Beliefs (qualities or standards considered worthwhile by the individual)
- Global mental functions (energy, drive, temperament, and personality)
- Spirituality (Guiding beliefs from beyond the physical plane) (American Occupational Therapy Association, 2008)

**Mental Functions/Cognitive skills:**
- Cognition: Assess level of arousal, alertness, orientation, attention span (selective, sustained, divided), ability to follow commands, memory, ability to learn new information, problem solving, and insight into deficits. Assess the best mode of learning (verbal, visual, written, kinesthetic). Appraise patient’s abilities to sequence tasks, organize an activity within an allocated time frame, and their ability to multi-task. Possible use of the Montreal Cognitive Assessment, Stroop Color and Word Test, Comprehensive Trail-Making Test, or Hooper Visual Organization Test may be indicated.

**Communication and Social skills:**
- Communication: Assess the patient’s ability to functionally express and understand verbal or written material. Observe for patient’s ability to initiate communication or a response, ability to maintain appropriate physical space, ability to acknowledge another’s perspective, and ability to take turns during conversation. Recommend a Speech/Language Pathology evaluation for any patient who is having difficulty with the ability to express or comprehend information.

**Visual function and Perceptual skills:**
- A functional and or formal visual perceptual assessment is performed, as indicated, to evaluate the following: Visual acuity, ocular motor control, visual attention, visual fields, neglect, body scheme, and visual discrimination. Vision is assessed based on a dependent hierarchy. Visual history is obtained prior to assessment.

**Movement Related/Motor and Praxis skills:**
- Upper Extremity Range of Motion (UE ROM): Assess bilateral UE AROM and PROM
- Strength: Assess bilateral UE strength with use of manual muscle testing, dynamometer, and pinch meter when indicated
• Sensation: Assess UE sensation for location of touch, light touch, sharp/dull discrimination, and stereognosis
• Coordination: Assess speed and accuracy of movement, manipulation of objects during functional activity, finger to nose testing of bilateral UE, dysdiadochokinesia (rapid alternating movements); Identify an intention or resting tremor
• Edema: Assess bilateral upper extremity edema with use of circumferential measurements when indicated
• Muscle Tone: Assess the presence of hypertonicity with use of the Modified Ashworth Scale
• Functional Mobility: Assess functional transfers and mobility. Initial evaluation of transfers may be initiated in the Intensive Care Unit. Activity orders are set by medical team. Progress to higher level function as patient’s activity tolerance increases and indicate need for assistive device

Performance in Areas of Occupation (ADLs, IADL’s, Education, Social Participation, Work, Sleep):
• Assess ADL’s: self-feeding, grooming, bathing, dressing, and toileting skills. Note the need for adaptive equipment or adaptive strategies in order to complete the task, as well the patient’s ability to integrate post-operative precautions into ADL’s
• Assess IADL’s as appropriate, but not limited to the following: Care of others, care of pets, financial management, home management, meal preparation, safety and emergency maintenance, shopping, rest and sleep (American Occupational Therapy Association, 2008)

Assessment:

Impairments (patient may exhibit one or more of the following):
• Arousal
• Orientation
• Attention Span
• Ability to learn new information
• Vision
• Problem solving
• Safety Awareness
• Executive functions/Insight/Judgment
• Visual/perceptual processing
• Upper extremity strength
• Upper extremity ROM
• Fine Motor Coordination
• Upper extremity muscle tone
• Posture/Balance
• Sensation
• Edema
• Lack of knowledge regarding the role of OT, post-operative precautions as integrated into daily activities
**Occupational Performance Limitations** (patient may exhibit one or more of the following):
- Self care
- Emergency response
- Medication management
- Financial management
- Home management
- Time management
- Driving/transportation
- Meal preparation
- Health management
- Care of others (children, elderly, pets)
- Management of electronic devices
- Learning/academics
- Return to work/role performance
- Social participation
- Leisure pursuit

(American Occupational Therapy Association, 2008)

**Prognosis and Expected Outcomes:**
The prognosis and outcome of patients following a craniotomy is highly dependent upon the cause resulting in the need for a craniotomy. Severity of a traumatic brain injury, pathology of tumor, location of injury or mass in the brain are some of the dependent variables that are used to gauge expected outcomes and prognosis for patients who have undergone a craniotomy.

On average, patients are discharged home within two to three days after a craniotomy if no complications occur. In complex cases where a craniotomy was performed, discharge plans are made based on patient’s medical and rehabilitation needs.

**Age Specific Considerations:**
Patients, at Brigham and Women’s Hospital, undergoing a craniotomy typically range in age from eighteen to ninety plus. The OT evaluation focuses on the individualized needs, routines, and life roles of each patient along the age spectrum. No particular age-specific considerations are involved.

**Goals:**
**Short Term Goals (STG’s):** These goals are anticipated to be met within one to three sessions. Goals are specific to the individual and are formulated based on the patient’s occupational therapy assessment, as well as the contextual supports patients will have upon discharge. Appropriate goals may include, but are not limited to the following:

- Patient will be independent to minimal assistance with seated bathing and dressing activities
- Patient will be independent to minimal assistance with functional mobility in the hospital room and bathroom
- Patient will be independent to minimal assistance with toilet transfers and hygiene
- Patient will demonstrate independence to supervision with integration of post-operative precautions into activities for home and for community
- Patient and/or patient’s caregiver will demonstrate safety awareness with ADL’s and IADL’s 100% of the time

Long Term goals (LTG’s): These goals are anticipated to be met after the patient has completed all occupational therapy services for the episode of care (including rehabilitation, home care, and outpatient services). Appropriate goals may include but are not limited to the following:

- Patients with a non-complicated medical course are anticipated to obtain the highest level of independence with ADL’s, IADL’s, and functional mobility with the least restrictive device, durable medical equipment, compensatory strategies, and environmental modifications as needed. Timeframes will vary based on each patient’s current functional level as well as the extent of neurological involvement.

Treatment Planning / Interventions:
“Interventions may focus on a single aspect of the domain, such as a specific performance pattern, or several aspects of the domain, such as performance patterns, performance skills, and context.” (American Occupational Therapy Association. (2008). Patients are seen, on average, two to three times per week or as needed based on clinical assessment.

Interventions most commonly used for this case type/diagnosis:
- Therapeutic use of occupations and activities to help patients attain their goals
- Remediation/restoration of performance skills, performance patterns and patient factors (body functions, body structures) when impairment results in declined functional performance
- Modify/compensate/adapt context, activity demands and performance patterns for maximal occupational performance when patient factors are not likely to change or performance skills are not likely to improve
- Prevent decline in performance skills, performance patterns, and patient factors (American Occupational Therapy Association, 2008)

Specific interventions may include (but are not limited to):
- ADL retraining:
  - Safety while performing ADL’s
  - Potential need for adaptive or durable medical equipment
  - Strategies to compensate for any residual deficits
- Functional transfer and mobility retraining:
  - Graded progression of balance and activity from seated to ambulatory level with device as needed
  - Graded progression in functional toilet and tub transfers
  - Recommendation for environmental modification to compensate for motor, visual, perceptual, and cognitive deficits
- Cognitive remediation:
  - Recommendation and implementation of compensatory strategies and environmental modifications to compensate for cognitive impairments
  - Education to patient and family regarding potential safety issues with specific cognitive impairments
• Neuromuscular retraining:
  - Treatment through various theories of the neurodevelopmental frame of reference based on the clinician’s skill set and knowledge of the various theories.
    ▪ Facilitation
    ▪ Inhibition
    ▪ Muscle strengthening / specific exercise programs
      o Isotonic Active-Assistive Exercise, Isotonic Active Exercise, Isometric Exercise, Isotonic Resistive exercise, Isometric Resistive Exercise, Isokinetic Exercise
    ▪ Splinting (Neistadt, & Blesedell Crepeau, 1998)

• Visual Perceptual retraining:
  - Treatment of the deficit with use of a remedial approach or adaptive approach dependent on the visual deficit being addressed.
    ▪ Use of contrast to highlight objects locations
    ▪ Use of light filtering eye patching to reduce visual accommodation impairments
    ▪ Development of strategies to compensate for visual field loss or neglect incorporating graded visual, tactile, verbal cues as appropriate
    ▪ Label important items, keeping them in their upright position, and keeping items in the same location (Zoltan, 1996)

• Patient and or family education:
  - Realistic expectations to restore impairment or dysfunction, as well as expected outcomes post rehab
  - Patient and family support as well as empathy for current condition
  - Continuous instruction regarding improving and enhancing occupational performance, patient satisfaction, adaptation, health and wellness, prevention of further impairment and dysfunction, and maximizing quality of life

• Recommendations and referrals to other providers:
  Patients that have undergone a craniotomy receive automatic consults to physical and occupational therapy, as well as to care coordination. Extensive collaboration occurs between the medical doctors, physician assistances, nurses, rehabilitation team and care coordination. The intensive care nurses perform a swallowing screen on each patient, and will request a Speech and Language consult if the patient fails the screen. Other team members include Social Work, Dieticians, Pharmacists, and Psychiatrists. Occupational therapists may make a recommendation for Neuro-optometry, if appropriate.

Re-evaluation:
Patients are re-evaluated every seven to ten days while at BWH to provide a current functional status and to update short term goals as well as discharge recommendations. If short term goals are not being met, the factors limiting progress should be identified in the documentation. Re-evaluation is performed prior to this timeline if a significant change in medical status occurs.

Discharge Planning:
Discharge planning begins upon admission, and is individualized for each patient. It is dependent on medical, social, and functional status at time of discharge. If the patient requires continued treatment in a structured setting, a referral to a rehabilitation facility or a skilled nursing facility is initiated by care coordination.
If the patient is medically cleared and all goals setup by the team are achieved, a home discharge is usually appropriate. If twenty-four hour assistance of a caretaker is required for safe discharge, it is documented and clearly communicated to family and or caretaker. Short-term or long-term goals requiring additional skilled occupational therapist services can be met through referral to home or out-patient services.

**Transfer of Care:**
An occupational therapy discharge referral is prepared in the BICS system prior to Discharge for those patients requiring ongoing OT intervention. This document includes current functional status, STG’s, LTG’s, and a plan of care.

**Patient’s discharge instructions:**
Patients often discharge home on post-operative day two or three after a craniotomy. Patients and their families are issued a written education sheet from either the PT or the OT clinician entitled: “Discharge Instructions after Brain Surgery” (see attached). This material is a review of the post-operative precautions as they are integrated into daily activities. Specific written education can be provided to a patient and their families based on the OT’s clinical judgment.

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Discharge Instructions After Brain Surgery

Mobility and Positioning Recommendations

- When lying down, keep head elevated using at least two pillows.
- Move slowly when changing positions (e.g., going from lying to sitting and from sitting to standing) to avoid dizziness.
- Take frequent walks starting within your home and progress to longer walks outdoors. Increase your walking time based on your comfort and tolerance.

What to Avoid (for 2-4 weeks following your surgery or until cleared by your doctor)

- Avoid bending over and putting your head in a lowered position e.g., bending over toward the ground to tie your shoes or picking up objects from the floor.
- For the first 2 weeks, do not lift anything greater than 10 lbs. Then gradually increase the amount you lift as tolerated.
- Avoid straining or holding your breath.
- Do not participate in strenuous activity or pounding exercise e.g., jogging. You are allowed to exercise for conditioning but avoid exercises that will raise your blood pressure e.g., weight lifting or vigorous aerobic exercise.
- Avoid driving until cleared by your doctor.

Activities of Daily Living (ADLs)

- You may shower after your surgery but cover your incision with a shower cap or a waterproof dressing until the sutures are removed. After showering, make sure to remove the dressing immediately and leave your incision open to air.
- To save energy or to increase your safety, it may be helpful to sit during showering or have someone assist you.

In the hospital, you may have been instructed in additional guidelines that are specific to your case. If so, please continue the precautions provided to you by the therapist or the doctor.

Patient’s Name ____________________________ Date ______________
Therapist’s Name __________________________ Date 2/08