Brain Tumor Rehabilitation Across the Continuum of Care: Adult Perspectives
Meghan Moore PT, DPT, STAR/C
Cynthia Barbe PT, DPT, MS, STAR/C
Gabrielle Steinhorn PT, DPT, NCS

Objectives
1. Describe the types and classification of brain tumors most common in the adult population.
2. Explain staging and grading of adult brain tumors.
3. Identify types of interventions for primary brain tumors and implications these have for successful rehabilitation.
4. Discuss strategies to implement outcome measures for the brain tumor population across the continuum.

Brain Tumor Care at The Johns Hopkins Hospital
- The Johns Hopkins Comprehensive Brain Tumor Center is one of the largest brain tumor treatment and research centers in the world.
- Rehabilitation occurs across the continuum from the Neuro Critical Care Unit and Oncology Critical Care Unit, step down acute care floors, inpatient acute rehab, home therapy and outpatient rehabilitation.

DISCLAIMER
All speakers have nothing to disclose.
All equipment described in the presentation are what is available at our facilities, and speakers have no financial gain from discussing them.
All photos and videos used in this presentation have been granted consent from the patients and/or their families. Consent forms have been signed. And are property of The Johns Hopkins Hospital for educational purposes only.

Tumor Classification

<table>
<thead>
<tr>
<th>Primary Brain/CNS Tumor</th>
<th>Metastatic tumor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arise in CNS</td>
<td>Cancer cells begin in lung, breast, colon, skin</td>
</tr>
<tr>
<td>Malignant or non-malignant</td>
<td>Spread to brain via bloodstream</td>
</tr>
<tr>
<td>Named for cells in which they originate</td>
<td>Life-threatening</td>
</tr>
<tr>
<td>Examples - Gliomas from glial cells, astrocytoma from astrocytes</td>
<td>By definition- all are malignant</td>
</tr>
</tbody>
</table>

Tumor Classification

<table>
<thead>
<tr>
<th></th>
<th>Malignant</th>
<th>Benign (non malignant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usually rapid growing</td>
<td>Slow growing</td>
<td></td>
</tr>
<tr>
<td>Invasive</td>
<td>Distinct borders</td>
<td></td>
</tr>
<tr>
<td>Life-threatening- can spread within brain and spine</td>
<td>Rarely spreads</td>
<td></td>
</tr>
<tr>
<td>Examples - Glioma, astrocytoma, glioblastoma</td>
<td>Examples - Vestibular schwannoma, meningioma, pituitary adenoma</td>
<td></td>
</tr>
</tbody>
</table>
### WHO Grading System

**Grade I**
- Slow growing cells
- Almost normal in appearance under microscope
- Least malignant and usually associated with long term survival

**Grade II**
- Relatively slow growing cells
- Slightly abnormal appearance under a microscope
- Can invade adjacent normal tissue

**Grade III**
- Actively reproducing abnormal cells
- Infiltrate adjacent normal brain tissue
- Tend to recur, often at a higher grade

**Grade IV**
- Abnormal cells that reproduce rapidly
- Form new blood vessels to maintain rapid growth
- Areas of dead cells in the center

### Epidemiology – Incident Rate

- Incidence rate of all primary malignant and non-malignant brain and CNS tumors is 21.42 cases per 100,000.
  - Malignant tumors: 7.25 per 100,000
  - Non-malignant tumors: 14.17 per 100,000
- An estimated 68,480 new cases of primary brain and CNS tumors are expected to be diagnosed in the US in 2015.
  - An estimated 23,180 primary malignant diagnosed
  - An estimated 45,300 non-malignant diagnosed
- From birth, an American has 0.62% chance of being diagnosed with a primary malignant brain/CNS tumor and a 0.46% chance of dying from a primary malignant brain/CNS tumor.

---

**Distribution of Primary Brain and CNS Tumors by Behavior (N = 343,175), CBTRUS Statistical Report: NPCR and SEER, 2007–2011.**

**Distribution of All Primary Brain and CNS Tumors by Site (N = 343,175), CBTRUS Statistical Report: NPCR and SEER, 2007–2011.**

**Distribution of Malignant Primary Brain and CNS Tumors by Site (N = 115,799), CBTRUS Statistical Report: NPCR and SEER, 2007–2011.**

**Distributions of All Primary Brain and CNS Tumors by CBTRUS Histology Groupings and Histology (N = 343,175), CBTRUS Statistical Report: NPCR and SEER, 2007–2011.**
Epidemiology – Survival

<table>
<thead>
<tr>
<th>Age of Diagnosis</th>
<th>5 year survival rate – Primary Malignant</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19 years</td>
<td>73.3%</td>
</tr>
<tr>
<td>20-44 years</td>
<td>58.5%</td>
</tr>
<tr>
<td>45-54 years</td>
<td>31.1%</td>
</tr>
<tr>
<td>55-64 years</td>
<td>17.7%</td>
</tr>
<tr>
<td>65-74 years</td>
<td>10.5%</td>
</tr>
<tr>
<td>75 years and older</td>
<td>5.9%</td>
</tr>
</tbody>
</table>

• 5 year survival rate after diagnosis with a non-malignant tumor is 91.9% in the US
• 5 year survival rate after diagnosis of a malignant tumor is 34.2% (overall)

Causes and Risk Factors

• Environmental Factors
  – Exposure to ionizing radiation

• Genetic Factors
  – Few hereditary genetic syndromes (ex. Neurofibromatosis, Von Hippel Lindau Syndrome)
  – Genetic mutations
    • Tumor suppressor genes - TP53 mutation plays a role in causing low grade tumors develop into high grade tumors
    • Growth factors – EGFR shown to be in high quantities in high grade tumors
    • Familial genetic links in gliomas

Symptoms leading to referrals

• Unrelenting headache
• Seizure
• Focal neurological deficits
  • Language impairment
  • Unilateral weakness and/or sensory deficits
  • Central vestibular signs
• Personality changes

Diagnostic Tests

• Imaging Studies
  – CT scan (with and/or without contrast)
  – MRI (with and/or without contrast)
  – Functional MRI
  – Angiography
  – PET
• Laboratory Tests
  – Lumbar puncture – CSF analysis
  – Endocrine evaluation – for pituitary and hypothalamic tumor
• Biopsy

Gliomas

• Three types of glial cells
  – Astrocytes → astrocytomas
  – Oligodendrocyte → Oligodendrogliomas
  – Ependymal → Ependymomas
• Primary malignant tumors
• Grades I-IV

Gliomas - Astrocytomas

• Grade I – Pilocytic Astrocytoma
• Grade II – Diffuse Astrocytoma
• Grade III – Anaplastic Astrocytoma
• Grade IV – Glioblastoma Multiforme
### Gliomas - Oligodendroglioma
- Grade II or Grade III (anaplastic)
- Occur most frequently in young and middle aged adults
- 50% of oligos occur in the frontal lobe
- Surgery with possibility of radiation
- Chemo may be used for grade III

### Gliomas - Ependymomas
- Ependymal cells line the ventricles of the brain and center of the spinal cord.
- Rare – Account for 2-3% of primary tumors, however in children they account for 30% of primary tumors
- Typically slow growing and often Grade I
- Surgical resection often followed by radiation

### Meningiomas
- The most common non-malignant tumor
- Accounts for 36% of all primary tumors
- Arise from the arachnoid layer of meninges
- Majority are benign, grade I, localized and non-infiltrating.
- Risk factors – prior radiation exposure to the head; neurofibromatosis type 2
- Surgical resection
- Malignant meningiomas account for < 5% of meningiomas – grade III

### Vestibular Schwannomas
- Benign, slow growing
- Account for 8% of primary tumors
- Middle aged adults (30-60 years)
- Females twice as likely to have
- Surgical resection vs. stereotactic radiosurgery
- Bilateral tumors are rare and almost associated with neurofibromatosis 2

### Pituitary Adenomas
- Benign and slow growing
- Represent approx. 10% of all primary tumors
- Can cause pressure on optic chiasm
- Secreting vs non-secretion
- Transphenoidal approach for surgical resection
- May need hormone replacement

### Neurofibromatosis (NF)
- Genetic disorder that causes a predisposition to tumor formation.
- NF Type 1 Systemic Disease
  - Derm involvement
  - Visual changes
  - Bony malformations
  - Vascular malformations
- NF type 2
  - Vestibular schwannomas, meningiomas, peripheral schwannomas, ependymomas
- Neurofibromatosis (NF) Type 1 cutaneous and subcutaneous neurofibromas
- MRI – NF Type 2 – Bilateral Vestibular schwannomas and several extra axial masses in posterior fossa consistent with meningiomas.
CNS Lymphoma

- Immunocompromised patients are at higher risk (HIV, organ transplant recipients)
- 0.5% to 2% if all primary brain tumors.
- Most often occurs in cerebral hemisphere – can involve CSF and spinal cord.
- Diagnosed via biopsy
- Symptoms – personality and behavioral changes, increased ICP, hemiparesis, seizures
- Treatment
  - Resection if there is significant pressure
  - Steroids to control cerebral edema
  - Radiation therapy and/or chemotherapy are standard

Metastatic CNS Tumors

Treatment - Surgical

- Total Resection or Debulking
- Complications
  - Cerebral edema
  - Bleeding or contusion
  - Seizures
  - Infection
  - CSF leak
  - Increased ICP
  - Residual neurological deficits

Treatment - Radiation

- Primary treatment or adjunct to surgery
- External application
  - Stereotactic radiosurgery
  - Whole brain radiation
  - Palliative radiation
- Side effects

Treatment - Chemotherapy

- Routes
  - PO
  - Intravenous
  - Intrathecal
  - Gliadel® wafers*
- Gliadel® wafers *
  - Invented and developed by Dr. Henry Brem, Neurosurgeon at JHH
  - Placed intra-operatively
  - Accurately and directly deliver potent chemotherapies at the brain tumor site.
- Side Effects

Treatment - Corticosteroids

- Indications
  - Used to decrease edema around the tumor or that is caused by treatment
  - Can be used before or after tumor resection
  - Can be used to reduce edema caused by radiation treatment
- Side Effects
  - Impaired glucose control
  - Proximal muscle wasting
  - Steroid induced personality changes (mood swings)
  - Weight gain (increased appetite)
Treatment – Cancer Immunotherapies

- Broad Categories
  - Cancer Vaccines: Norovirus
  - Checkpoint Inhibitors
  - Oncolytic Virus Therapies
  - Adoptive Cell Therapy
  - Adjuvant Immunotherapies
  - Monoclonal Antibodies
- Most are in Phase I/II clinical trials
  - clinicaltrials.gov
  - cancerresearch.org

Treatment – Seizure Prophylaxis

<table>
<thead>
<tr>
<th>Drug</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbamazepine (Tegretol)</td>
<td>diplopia, dizziness, drowsiness</td>
</tr>
<tr>
<td>Valproic Acid or Depakote</td>
<td>drowsiness, nausea, diarrhea</td>
</tr>
<tr>
<td>Gabapentin (Neurontin)</td>
<td>dizziness, drowsiness, fatigue, slurred speech</td>
</tr>
<tr>
<td>Levetiracetam (Keppra)</td>
<td>sedation, dizziness, nervousness</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>lack of concentration, sleepiness, depression, HA</td>
</tr>
<tr>
<td>Phenytoin (Dilantin)</td>
<td>drowsiness, dizziness, hypotension, jerky eye movements, imbalance</td>
</tr>
</tbody>
</table>

Current Research: Acute Care Services

- Early mobility is essential to prevent the negative effects of immobility— including pneumonia, atelectasis, and DVT (www.aann.org)
- Exercise may modulate the BBB integrity which may lead to protection against metastatic progression (Wolff 2015)
- Exercise may counteract the physical and psychological impairments associated with neurologic malignancies (Cormie 2015)

- Early mobility in the ICU assists with increased functional outcomes and decreased ICU and hospital LOS (Stiller 2013)
- Early PM&R interventions in the ICU are safe and feasible in the neuro ICU (Mendez-Teller 2012)
- Rehabilitation after surgery improves functional outcomes regardless of tumor type (Bartolo 2011)

Acute Care Services

MD Teams
- Neurology Service
- Neurosurgery Service
- Medical Oncology Service
  (Manage own critical beds)
- Radiation Oncology Service
- Orthopedics
  (When needed)

Multi-Disciplinary Approach
- Physical Therapy
- Occupational Therapy
- Speech Language Pathology
- Physicians
- Nurses
- Social Workers
- Palliative Care Team
- Pastoral Care
- Psychiatric Nurse Liaison
- Physiatrists

All within JHH main campus— depending on patient presentation, patients are admitted, and consults can be obtained. Plan of care put into action, and transfers between services are facilitated.
**Things to consider… Side Effects**

### Chemotherapy

**Myelosuppression:**
- Low WBCs
- Low RBCs
- Low platelets

**CIPN**
- Sensory and motor changes due to damage to peripheral nervous system from neurotoxic agents
- 70% of pts develop when treated with certain chemotherapy drugs; leads to increased falls

**Cognitive changes**
- "Chemo-brain"

**Cardiotoxicity**
- Changes to the functioning of the heart muscle
- Edema in hands and/or feet, SOB, dizziness, erratic heartbeats

**Side effects**
- Fatigue
- N/V
- Weakness
- Lethargy
- Anemia
- Falls
- Weakness
- Balance deficits

### Radiation

- Most begin during the second or third week of treatment; however, late effects can continue well after the final treatment
- Side effects can vary depending on area radiation is given
  - Fatigue
  - N/V
  - Weakness
  - HA
  - Necrosis
  - Cerebral edema

### Pharmacology

#### Anti-convulsants

- Phenobarbital
  - May reduce effects of corticosteroids
- Dilantin
  - May reduce effects of corticosteroids
- Keppra
- Neurontin
- Depakote
  - May decrease platelets over long term
- Tegretol

#### Corticosteroids

**Types**
- Prednisone
- Dexamethasone (Decadron)
- Methylprednisolone (Solumedrol)

**Side Effects**
- Weight Gain
- Increases Na+, Decreases K+, and Ca++
- Proximal muscle weakness
- Mood swings, euphoria, depression
- Insomnia
- Hyperglycemia
  - Potentially disrupts the BBB and result in increased cerebral edema

**Suppression of the immune system**
- Used as anti-inflammatories
- Increases infection rate
- Decreases antibiotic effectiveness

#### H2 Blockers

- Lansoprazole (Prevacid)
- Omeprazole (Prilosec)
  - Increases Dilantin in the blood
- Pantoprazole (Protonix)

**Side effects:**
- Increases Dilantin in the blood
- Muscle pain
- Insomnia
- N/V

**Sucralfate**
- Decreases absorption of Dilantin

**Proton Pump Inhibitors**

- Lansoprazole (Prevacid)
- Omeprazole (Prilosec)
  - Increases Dilantin in the blood
- Pantoprazole (Protonix)

**Side effects:**
- Increases Dilantin in the blood
- Muscle pain
- Insomnia
- N/V

**Gastric Acid Inhibitors**

- Lansoprazole (Prevacid)
- Omeprazole (Prilosec)
  - Increases Dilantin in the blood
- Pantoprazole (Protonix)

**Side effects:**
- Increases Dilantin in the blood
- Muscle pain
- Insomnia
- N/V

**Sucralfate**
- Decreases absorption of Dilantin

**Corticosteroids**

- Prednisone
- Dexamethasone (Decadron)
- Methylprednisolone (Solumedrol)

**Side Effects**
- Weight Gain
- Increases Na+, Decreases K+, and Ca++
- Proximal muscle weakness
- Mood swings, euphoria, depression
- Insomnia
- Hyperglycemia
  - Potentially disrupts the BBB and result in increased cerebral edema

**Suppression of the immune system**
- Used as anti-inflammatories
- Increases infection rate
- Decreases antibiotic effectiveness
Things to Consider…
Hemodynamics

**Vitals**

**Blood Pressure**
- Watch with changes in position: orthostasis
- MDs targeting systolic at <160mmHg

**Mean Arterial Pressure (MAP)**
- May have a defined goal set by the MDs

**Heart Rate (HR)**
- Can be affected by dehydration

**O₂ sat (vent settings if in critical care)**
- Weaning dependent upon pt. status and MD/facility

**Intracranial Pressure (ICP)**
- 7-15 mmHg normal; MUST be clamped prior to position changes

---

Things to Consider…
Lab Values

**Glucose**
- Hyperglycemia
  - Result of steroid therapy
  - Supplemental feeding

**Potassium**
- Increased: Arrhythmias

**Sodium**
- SIADH: Syndrome of Inappropriate Anti-Diuretic Hormone
  - Hyponatremia due to excess of water
  - Inappropriate continued secretion or action of hormone
  - Confusion, delirium, ataxia, seizures, coma

---

Things to Consider…
Environment & Equipment

**Ventilator**

**External Ventricular Device**

**Monitor**

---

Things to Consider…
Lines/Tubes/Drains

---

Things to Consider…
Clinical Picture

**Pain**

**Edema**

**Guarding**

**Tone**

**Spasticity**
ACS Objective Measures

**Physical Therapy**
- AMPAC- "6-Clicks"
- Cancer Related Fatigue Scale (CRF)
- Functional Assessment of CA Therapy Fatigue (FACT-F)
- Brief Fatigue Inventory (BFI)
- Piper Fatigue Scale (PFS)
- Timed up and Go (TUG)
- Gait Speed
- Berg Balance Scale (BERG)
- Dynamic Gait Index (DGI)
- Tinetti-POMA (Tinetti)
- Semmes Weinstein Monofilaments
- JFK Coma Scale

**Cancer Related Fatigue Screening**
- Do you have significant fatigue? YES
- Do you have diminished energy? YES
- Do you have an increased need to rest, disproportionate to any recent change in activity level? YES

Visual Analog Scales
- Fatigue Severity ( 0= No fatigue 10= Unbearable )
  - A. Rate how severe your fatigue is right now: 4
  - B. Rate how severe your fatigue is on your worst day: 10
  - C. Rate how severe your fatigue is on average: 7

Inpatient AM PAC Short Form: Mobility

How much difficulty does the patient currently have:
- 4- Unable; 3- A lot; 2- A little; 1- None
  - 1. Turning in bed (adjusting bed clothes, sheets, and blankets); 2- A Lot
  - 2. Sitting down on and standing up from a chair with arms; 1- Unable
  - 3. Moving from lying on back to sitting on the side of the bed; 2- A Lot

How much help from another person does the patient currently need:
- 4- Total; 3- A lot; 2- A little; 1- None
  - 4. Moving to and from a bed to a chair (including a wheelchair); 2- A Lot
  - 5. Need to walk in hospital room; 1- Total
  - 6. Climbing 3-5 steps with a railing; 1- Total

Raw Score: 9/24
Percentage of Disability: 81.38%
CMS Severity Modifier: CM

ACS Objective Measures

**Occupational Therapy**
- AMPAC- "6-Clicks"
- Cancer related Fatigue Scale (CRF)
- Montreal Cognitive Assessment (MoCA)
- Mini Mental State Exam (MMSE)
- Medication Management
- JFK Coma Scale

**Speech Language Pathology**
- Normative Outcome Measurement System-NOMS
- Repeatable Battery for the Assessment of Neuropsychological Status-RBANS
- Video Fluoroscopic Swallow Studies

Inpatient AM PAC Short Form: Activity

How much help from another person does the patient currently need:
- 4- Total; 3- A lot; 2- A little; 1- None
  - 1. Putting on and taking off regular lower body clothing; 2- A Lot
  - 2. Bathing (including washing, rinsing, drying); 3- A Little
  - 3. Toileting, which includes using toilet, bedpan, or urinal; 2- A Lot
  - 4. Putting on and taking off regular upper body clothing; 3- A Little
  - 5. Taking care of personal grooming such as brushing teeth; 3- A Little
  - 6. Eating meals; 3- A Little

Raw Score: 16/24
Percentage of Disability: 53.32%
CMS Severity Modifier: CK

The Montreal Cognitive Assessment (MoCA)

- A rapid screening tool for mild cognitive dysfunction.

- Naming: Patient scored 3/3 on naming subtest.
- Memory: Patient correctly recalled 2/5 words on first trial.
- Memory: Patient correctly recalled 2/5 words on second trial.
- Attention
- List of digits: Patient correctly stated 1/2 digit sequences (forwards & backwards).
- List of Letters: Patient had less than 2 errors with letter tapping sequence.
- Serial 7 Subtraction: Patient had 1 correct serial 7 subtractions, starting from 100.
The Montreal Cognitive Assessment (MoCA)

Language:
- Sentence Repeat: Patient scored 2/2 on repeating sentences subtest.
- Fluency: Patient recited less than 11 words starting with the letter "F" in 1 minute.
- Abstraction: Patient scored 1/2 with word similarity.
- Delayed Recall: Patient recalled 2/5 words with no cues. Pt able to recall 1 word without cues and 1 word with multiple choice cues
- Orientation: Patient scored 5/6 on orientation.

MoCA Total Score = 19 /30
Comments: Normal is greater than or equal to 26/30.

NOMS- 7 point system that describes changes in patients' functional communication and/or swallowing

- Spoken Language Expression Level 5: Patient initiates structured conversations with familiar and unfamiliar partners. Requires minimal cueing to frame more complex sentences. Patient will occasionally self-cues when encountering difficulty.
- Spoken Language Comprehension Level 3: The patient usually responds accurately to simple yes/no questions and is able to follow simple directions out of context, with moderate cueing. Accurate comprehension of more complex directions/messages is infrequent.

NOMS- 7 point system that describes changes in patients' functional communication and/or swallowing

- Attention
- Memory
- Motor Speech
- Pragmatics
- Problem Solving
- Orientation
- Fluency
- Augmentative-Alternative Communication
- Reading
- Spoken Language Comprehension
- Spoken Language Expression
- Swallowing
- Voice
- Voice following
- Tracheostomy
- Writing

ACS Objective Measures

Physicians & Palliative Care
- Palliative Performance Scale (PPS)
- Karnofsky Performance Scale (KPS)
- Eastern Cooperative Oncology Group (ECOG)

Interventions

Physical Therapy
- Strength
- Gait
- Balance
- Coordination
- Mobility
- Transfers

Speech Language Pathology
- Language
- Articulation
- Swallowing
- Cognition

Occupational Therapy
- ADLs
- Cognition
- Safety

Social Work
- Discharge planning
- Community resources
Case Presentation
Mr G.H.K. presented to the ED with 3 day h/o:
• worsening mental status
• R sided weakness
• personality changes
• labs with decreased Hct

Neuro Team consulted and admitted to NCCU; diagnostics demonstrated worsening peritumor vasogenic edema and midline shift/uncal herniation

Case Presentation
PMHx:
• L sided weakness
• R frontal & parietal enhancing lesions (concern for high grade glioma versus metastatic disease)
• Adrenal Mass
• HTN
• Chronic Renal Failure
• Prior MI
• DM

PSHx:
• Open, awake R craniotomy
  – Pathology: anaplastic astrocytoma
• Post-op MRI: vasogenic edema
• Persistent L hemiparesis 2/2 tumor infiltration at motor cortex and vasogenic edema
• Chemo & XRT

Case Presentation
ACS medications:
– Pantaprazole (Protonix) & Omeprazole (Prilosec)- gastric secretions
– Dexamethasone
– Keppra
– Hypertonic solution- Na+
– Dilantin

NUS consulted → not a surgical candidate → transfer to ONC service

BLOF:
– Scoot to w/c with wife
– Stand with PT or OT’s assistance

Home:
– Functional 1st floor with ramp
– Owns w/c

Goals:
– Neuro Team: Take steps and walk- Neuro
– Oncology Team: Transfer to w/c with wife

Case Presentation: Imaging
9/18/15 CT
11/18/15 MRI & CT

Case Presentation: Objective Findings
• Bed mobility: R- Mod A; L- Min A; S/L to sitting- Max A
• Transfers
• PROM: WFL L UE/LE; AROM WFL R UE/LE
• Sensation: decreased to touch L UE/LE
• MMT: L UE 0/5; L LE hip flex/knee ext/ankle PF 1+/5
• Balance: Max A sitting
• Edema: L UE- Moderate
• Decreased attention; Max VCs to focus
• Inattention: L side; Mod VCs

ICF Model
“Health Condition”
(disorder or disease)
Body Functions and Structures
Activities
Participation

Personal Factors
Environmental Factors
Anaplastic Astrocytoma with vasogenic edema & uncal shift

Dec AROM L UE & LE, MMT L>R, edema, impaired cognition L side inattention & distractibility

Motivated to perform, decreased functional abilities & neuro-muscular function

1 level home with ramp to enter, family support

Motivated to participate, supportive family, quick progression of disease

Tilt-Bed MOVEO XP-DJO Comibizer

Letto Bike

Settings will depend on tone, spasticity, and strength

PROM, AAROM, AROM

Transfer boards, resistance bands, physioballs

Room prep- transfer from EOB to W/C

Sitting with UE support and trunk control- not leaning back into the sling

Sara Plus by ArjoHuntleigh

VCs for hip and trunk extension- tactile cues on L pelvis and glutes

Euphoria (“tear towel”) of corticosteroids
What is palliative care?

- According to World Health Organization
  - “…an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual”

- “The goal of palliative care is the achievement of the best possible quality of life for patients and their families.” (Santiago-Palma 2001)
What is hospice care?

• “...designed to give supportive care to people in the final phase of a terminal illness and focus on comfort and quality of life, rather than cure. The goal is to enable patients to be comfortable and free of pain, so that they live each day as fully as possible. Aggressive methods of pain control may be used.”

• “The philosophy of hospice is to provide support for the patient's emotional, social, and spiritual needs as well as medical symptoms as part of treating the whole person.”


Why investigate the research?

• Early palliative care shows improved quality of life, decreased medical cost, increased survival time (duration of services correlate with survival time)

• Manages physical symptoms, prognostic awareness, and psychological distress

• Inaccurate survival estimates can lead to delays in care discussions that affect goals and timing of care

• Majority of the research regarding exercise and involvement of therapies is in patients undergoing curative treatment

• General belief that there is not a role for therapy or exercise in this population because they will never “get better.”

Palliative Care in Patients with Brain Tumors

• 2006 NICE Guidelines recognize patients with BT may need a palliative approach from the time of diagnosis (Ford 2012)

• “Different from others in the cancer patient population due to the:
  - Complexity of supportive care needs
  - Trajectory of disease
  - Very short life expectancy
  - Presence of specific symptoms related to neurological deterioration
    • Therefore need a specific palliative approach” (Pompili 2014)

• If a patient has a BT, there is a decreased likelihood of receiving care from a palliative care specialist, while having the highest need for better symptom control. (Cat 2008)

Current Research: Palliative

• Roberts 2014: Patients with GBMs in inpatient rehabilitation.
  - Showed in 412 patients: 96.8% improved mobility; 88.4% self care, 75.8% in communication/social based on their FIM score
  - Median survival: 14.3 mons (Rehab) vs 17.9 mons (No rehab)
  - Although shorter survival- functional improvements for quality of life

• Pompili 2014: Home Palliative care in GBM
  - Good palliative care at home avoids improper and expensive hospitalizations and helps/familys/patients facing difficult situations
  - Seizures are most common reason for rehospitalizations → decreased QOL and increased overall costs
  - Family members and caregivers QoL is often neglected → recommends a global approach to care for the whole family.

Current Research: Palliative

• Faithfull 2005: Palliative care in Primary BTs
  - Only 10% of pts were admitted to hospice centers; rest in the community
  - Spouse was primary caregiver in 2/3s of pts
  - ½ of caregivers had difficulty with finances, and overall coping
  - 50% of pts referred to SW; only 21% saw a SLP while 65% had problems

• Ford 2012; Systematic Review of support care in primary malignant BT
  - Pts were surveyed on what would improve supportive care
    • Having well-resourced specialist nurse availability
    • Providing better community support for families
    • Better access to PT
    • More integrated services/team clinics
    • Better access to psychologists/counselors

Palliative Care

• Indications for services
  - Patients pursuing curative measures
  - Patients experiencing physical or emotional pain that is not under control
  - Patients are experiencing symptoms that are not under control
  - Patients require assistance understanding their condition
  - Patients who need help in coordinating care; can be initiated at any point in the disease process- even at time of diagnosis
Hospice Care

- Indications/qualifying for services
  - Not pursuing curative measures
    - Care not Cure- focus on Qol & comfort
  - DNR in place (not required)
  - Hospice diagnosis of “debility unspecified” (ICD-10) leading to “adult FTT”- Cancer Related Fatigue
  - MD certification of ≤ 6 month life expectancy
  - Imminent death
  - There exists a benefit for skilled services
  - Patients can opt out

JHH Palliative and Hospice

Palliative
- JHH Palliative Care Service is a consulting service throughout the hospital.
- May receive this service while in house and/or continue after we discharge.
- Can make referral to hospice organization

Hospice
- Referral from JHH to Gilchrist Hospice center (largest hospice organization in MD)
- Provides support at home or in acute inpatient center (Gilchrist Center)
- Services provide support in:
  - Physical
  - Social
  - Spiritual

Rehabilitation Therapy

Goals of Care

- Decrease pain
- Increase sleep quality
- Stretching
- Positioning
- Deep breathing
- Pulmonary function
- Safety- pt, family, environment
- Equipment recommendations
- Psycho- social aspects
- Maximize strength & endurance
- Decrease risk of falls & increase safety
- Maximize mobilization & functional activities
- Edema management
- Energy conservation
- Communication strategies
- Provide Exercise Program

Practice Patterns

- Rehabilitation: Light
  - Patients can & want to improve
  - Low to moderate intensity
  - Lower frequency of follow up
    - Therapy 1-2x/week with subsequent follow up by family, caregivers, RNs
  - Noted gradual improvement
    - RISK: improvement does not mean disease is gone
    - Rehabilitation & medical potential do NOT always match

Practice Patterns

- Rehabilitation in reverse
  - Moving from high to low level of functioning
  - New issues & equipment recommendations
  - Re-establish goals at each level
  - Caregiver training with anticipated changes
  - Variable frequency based on progression

40 y/o with Grade II Astrocytoma \(\rightarrow\) s/p falls \(\rightarrow\) B DF weak \(\rightarrow\) cane, AFO \(\rightarrow\) progressed to Grade III Astrocytoma \(\rightarrow\) RW, weak quads \(\rightarrow\) progressive ascending weakness \(\rightarrow\) sliding board, w/c, drop arm BSC \(\rightarrow\) mechanical lift

Practice Patterns

- Skilled maintenance
  - Skilled intervention without functional gain
  - PT, OT, & SLP- to assist as what can be accomplished is beyond family member/caregiver to perform
  - Assist with facilitation, coordination, positioning/posturing
  - Quality of life
  - Comfort
  - Letting go
    - Recognizing when patient &/or family has decided to discontinue skilled need
    - As healthcare providers, want patients to improve-sometimes difficult to shift care & discharge recommendations
C.O.M.F.O.R.T

*Communication:* Using clear & familiar language
*Orientation:* Setting realistic expectations
*Mindfulness:* Centering attention on the patient
*Family:* Including families in conversations
*Ongoing:* Continually communicating with the patient/family/caregiver
*Reiterative:* Restating the messages repeatedly
*Team:* Sharing information within the interdisciplinary team

“You matter because you are you. You matter to the last moment of your life, and we will do all we can not only to help you die peacefully, but also to live until you die.”

Dame Cicely Saunders
1918-2005

What about SAR?

- Paucity of research of outcomes of BT pts who go to SAR
- In a QI for improving referrals to SAR from a Cancer Center in 2013, 1 of 25 pts referred to SAR returned for further treatment
- Initiative to discuss pts’ POC with multi-disciplinary team-attending, therapies, SW, RN, and Palliative Care-regarding referrals to inpatient rehab meshing with goals of care
- Early intervention of the Palliative Care team assisted with dec referrals to SAR, discussing initiation of hospice care, and thus preventing pt dissatisfaction and re-admission back from SAR only to be placed in hospice care

Current Research: Inpatient Rehabilitation

- Half of all rehabilitation hospitals do not treat more than 10 patients with BT annually (Kirsblum 2001; Boake 1993)
- Persons with BT, across tumor types, have significantly improved function after course of inpatient rehabilitation (Kirsblum 2001)
- No RCTs to date looking at best evidence for rehabilitation
  - Ten studies addressed efficacy of multi-disciplinary rehabilitation (Khan 2013)
    - Report significant reduction in disability after period of multi-disciplinary inpatient rehab

Subacute Rehabilitation

Presented by
Cynthia Barbe PT, DPT, MS, STAR/C

Inpatient Rehabilitation

Presented by
Meghan Moore PT, DPT, STAR/C
Current Research: Cochrane Review: Khan 2013

- No significant difference in functional outcomes between different BT types. (Fu 2010)
- Compared BT versus TBI or stroke (6 studies)
  - All reported BT greater gains compared to stroke or TBI
- Four studies reported shorter length of stay (LOS) in BT compared to TBI/stroke (Greenberg 2006; Huang 1998; 2000; 2001)
- No different in LOS in BT versus TBI in study by O’Dell 1998
- Discharge location to home/community was comparable or greater in BT compared to stroke/TBI (Greenberg 2006; Huang 1998; 2000; O’Dell 1998)

JHH Comprehensive Intensive Inpatient Rehabilitation Program (CIIRP)

- Located in same hospital complex as acute care (ACS) floors for neurology and oncology
- Ability to transfer between ACS and CIIRP (Marciniak 2001)
  - Radiation (normally PM)
  - Chemotherapy
  - Acute medical changes
  - Neuro-Ophthalmology
  - Dialysis
  - Modified Barium swallow study
  - Wound Care

If patient from far away and undergoing treatment at CIIRP or OP, ability for family to stay at:
- Hackerman House: suites or apartments; specifically for patients with cancer who are receiving treatment 3 or more days consecutively.
- McEldery House: Fully furnished town homes, or single bedrooms with or without private bathrooms at discounted rates.

JHH CIIRP: Outcome Measures

<table>
<thead>
<tr>
<th>Test</th>
<th>TBI EDGE</th>
<th>Stroke EDGE</th>
<th>Highly Recommended</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Independence Measure (FIM)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Karnofsky Performance Status Scale (KPS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability Rating Scale (DRS)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of Stay (LOS)</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Discharge location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sitting/standing balance</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Gait Index</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Functional Assessment Measure</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified Ashworth Scale</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified Rankin scale</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Moss Attention Rating scale</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient Health Questionnaire</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of Life after Brain Injury</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ST 36</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Timed Up and Go</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
| Trunk impairment scale | | | X | | "Highly Recommended"
Impact of a Pneumatic Support Walker on Functional Mobility, and Patient Safety in the Neurological Patient Population in the Acute Care Setting

• **Study Type**: Prospective case series per JHH IRB approval
• **Patient population**: Patients with sensory, proprioceptive, and/or coordination deficits
• **Outcome Measures**: Impact of the PSW was measured using gait distance, gait speed, 6 Click AMPAC score, 2 minute walk test (MWT) distance, level of assistance, and length of stay.
• **Per subjective reports, patients felt more support, increased independence, and confidence due to increased mobility post-surgery.**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age (y)</th>
<th>Gender</th>
<th>Diagnosis</th>
<th>Length of Stay (days)</th>
<th>Discharge Location</th>
<th>Gait Distance (ft)</th>
<th>Gait Speed (sec)</th>
<th>Level of Assist</th>
<th>2 MWT (ft)</th>
<th># of Rests</th>
<th># of Falls</th>
<th>6 Click AMPAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27</td>
<td>F</td>
<td>CIDP</td>
<td>7</td>
<td>Rehab &gt;90</td>
<td>325</td>
<td>1.250</td>
<td>CGA</td>
<td>Walker</td>
<td>11</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>M</td>
<td>Brain tumor (BT)</td>
<td>220</td>
<td>Walker</td>
<td>1530</td>
<td>1.600</td>
<td>CGA</td>
<td>Walker</td>
<td>45</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>F</td>
<td>Brain tumor (BT)</td>
<td>10</td>
<td>CGA</td>
<td>10</td>
<td>0.380</td>
<td>Min A x 2</td>
<td>Walker</td>
<td>68</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>F</td>
<td>Brain tumor (BT)</td>
<td>22</td>
<td>CGA</td>
<td>220</td>
<td>0.297</td>
<td>Min A x 2</td>
<td>Walker</td>
<td>68</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Average</td>
<td>36</td>
<td>1 M, 4 F</td>
<td>CIDP, 3BT, CVA</td>
<td>7</td>
<td></td>
<td>1705</td>
<td>0.932</td>
<td>Min A x 2</td>
<td>Walker</td>
<td>65</td>
<td>3</td>
<td>15</td>
</tr>
</tbody>
</table>

JHH CIIRP: Balance Interventions

- Bosu Ball
- Standing Foam Mat
- Wii Fit
- NeuroCom Balance Master

Case Example: Meningioma

Dynamic Body weight support system video: Balance
Case Example: Meningioma
Dynamic body weight support system video: Walking

Case Example: Meningioma
Dynamic body weight support system video: Step Ups

Home Health
Presented by
Meghan Moore PT, DPT, STAR/C
Department of Physical Medicine and Rehabilitation
Johns Hopkins Hospital

Current Research: Home Health
• Study showed significant functional gains based on:
  – Barthel Index
  – Karnofsky Performance Status Scale (KPS)
• Improved quality of life was also noted after multi-disciplinary rehabilitation approach in home setting
  – European Organization for Research and Treatment of Cancer (EORTC)
    • General and brain tumor specific questionnaire (EORCT QLQ-C30-BN20)

JH Home Care Group (JHHCG)
• Johns Hopkins Home Care Group (JHHCG) is a full-service home care provider.
• Provides bridge from Acute care or inpatient rehabilitation to Outpatient or Palliative/ Hospice
• Multi-disciplinary team available 24/7
  – Registered nurses
  – PT
  – OT
  – SLP
  – Certified home health aides
  – Social workers
  – Nutritionist
• Staff members are chosen for their expertise in specialized areas of clinical care and patient education.

JHHCG: Outcome Measures
Physical Therapy†
• Timed Up and Go (TUG)
• BORG Rate of Perceived Exertion
• Tinetti-POMA
• Short Physical Performance Battery
• 5x sit to stand (FTST)
• Home Care AMPAC

Occupational therapy†
• BORG Rate of Perceived Exertion
• Modified Barthel
• Activities Balance Confidence Scale (ABC)
• Functional Reach
• Home Care AMPAC

*Based on what JHHCG uses; ~ Based on current research
• Outcome measures are performed at initial examination, after 30 days, and discharge.
• Use of OASIS data collection
  • Functional scores reported publically on Centers for Medicare/ Medicaid services
  • 9 outcomes and 11 process measures
Outpatient Rehabilitation

Presented by
Meghan Moore PT, DPT, STAR/C

Department of Physical Medicine and Rehabilitation
Johns Hopkins Hospital

Current Research: Outpatient

Families/caregivers struggle to cope with new demands:
(Khan F 2013)

- Increased care needs
- Inability to drive/return to work
- Financial constraints
- Marital stress
- General functional limitations in patient

Utilized multi-disciplinary rehabilitation and reported favorable participation outcomes that maintained at 8 months after discharge. (Sherer 1997)

Based on:
- Community independence (Level of assistance)
- Employment via vocational (productivity) outcomes

Current Research: Outpatient

Brain tumor verse other acquired brain injury (Koobum 2001)

People with brain tumors have:
- Progressive functional decline
- Psychologic adjustment to changing disability and overall prognosis
- Role depression, fatigue, and medical instability in rehab progress
- Increased need for reassessment and adjustment of interventions

Whitten 1997:
- Survivors of BT, who 90% were ambulatory, reported some type of morbidity affecting their health
- 80% of those reported multiple impairments (sensory, emotional, and cognition)

JHH Outpatient Programs

Pure Cancer Rehabilitation

Restorative/Compensatory Rehabilitation

JHH Cancer Rehabilitation Program (CRP)
- Based on STAR oncology program

JHH Brain Rehabilitation Program (BRP)

Generally ends up as a combination of the two programs

Most patients seen in BRP

**Allows team members to develop an individualized approach for each patient (Sherwood 2006)

JHH Cancer Rehab Program (CRP)

Program Details

- Based on the principles of the STAR Program™ (Survivorship Training and Rehab Program)
- Our goal is to improve daily function and quality of life for the cancer survivor.
- Interventions based on symptoms from chemotherapy or radiation
  - Chemotherapy Related Fatigue
  - Deconditioning/Decreased balance
  - Postural changes
  - Generalized Weakness
  - Lymphedema (generally not BT specific)
  - Pain/joint stiffness
  - Peripheral Neuropathy

JHH Cancer Rehab Program (CRP)

Multi-Disciplinary Team

- Physiatry
- Physical Therapy
  - Lymphedema Management
  - Men and Women’s Health
- Occupational Therapy
  - Lymphedema Management
- Rehabilitation Psychology
- Speech-language Pathology
**JHH CRP: Outcome Measures**

**Cancer Specific**

<table>
<thead>
<tr>
<th>Measure</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer’s Overall Impact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Impact Problem Profile Scale (PIPP)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cancer Rehab evaluation System- Short form (CARES-SF)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cancer Survivor Unmet Needs Measure (CSUN)</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Fatigue**

<table>
<thead>
<tr>
<th>Measure</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue Analog Scale (FAS)</td>
<td>X*</td>
<td></td>
</tr>
<tr>
<td>FACIT (Used if FAS screen identifies a problem)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cancer Survivor Unmet Needs Measure (CSUN)</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

* Required at initial evaluation

---

**JHH Brain Rehabilitation Program (BRP)**

- Patient with BT have limitations in activity and participation domains of the WHO ICF model.
  - Cumulative effect over time
  - Distress to cancer survivors and their loved ones
  - Reduced quality of life (QoL). (Ness 2010)

Patient with BTs rarely avoid experiencing impairments in cognitive function related to their diagnosis.
- Critical to work to address all of these limitations based on the WHO ICF model.

---

**JHH CRP: Outcome Measures**

**Cancer Specific**

<table>
<thead>
<tr>
<th>Measure</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis Specified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMWT (if endurance an issue)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Neck Disability Index (NDI) (head and neck cancers)</td>
<td>X*</td>
<td></td>
</tr>
<tr>
<td>Balance measures (see BRP section)</td>
<td>X*</td>
<td></td>
</tr>
</tbody>
</table>

**Functional Reporting**

<table>
<thead>
<tr>
<th>Measure</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMPAC Mobility</td>
<td>X*</td>
<td></td>
</tr>
<tr>
<td>AMPAC-ADLs</td>
<td>X*</td>
<td></td>
</tr>
</tbody>
</table>

**Pain**

<table>
<thead>
<tr>
<th>Measure</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Analogue Pain Scale</td>
<td>X*</td>
<td></td>
</tr>
</tbody>
</table>

* Required at initial evaluation

---

**JHH Brain Rehabilitation Program (BRP)**

- Created with a multi-disciplinary approach
- Program caters to all neuro diagnoses:
  - Multiple Sclerosis
  - Parkinson’s disease
  - Stroke
  - Traumatic brain injury
  - Brain tumor
  - Rare neuro diagnoses
- Interventions based on location of brain tumor and residual neuro deficits related to:
  - Surgical intervention
  - Radiation intervention
  - Chemotherapy intervention

---

**Importance of Multidisciplinary team**

- Patients with BTs present with deficits including:
  - Memory
  - Strength
  - Coordination
  - Attention
  - Executive Function
  - Verbal Fluency
  - Visuospatial Perception
  - Deficits impact overall QOL of patient and caregivers.
  - Need for development of realistic and timely goals due to quicker progression of disability

- Multi-disciplinary team assists each other and the patient in developing their own skills to manage their own care including:
  - Coping ability
  - Knowledge Base
  - Improving quality of life
  - Self-advocating behavior
  - Goal-based interventions
  - Improving functional deficits
  - Improving cognitive deficits

Huge role of OT, SLP, rehab psychologists, and family/caregivers. Collaboration is critical.
**JHH CRP/BRP: Outcome Measures**

### Balance

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>6x Sit to stand</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Balance Confidence Scale (ABC)</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Berg Balance Scale</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Dynamic Gait Index (DGI)</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tinetti Balance Assessment Tool</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Highly Recommended

### Gait

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Minute walk Test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Minute walk test</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>10 meter walk test</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Community Balance and Mobility Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Level Mobility Assessment Tool (HiMAT)</td>
<td></td>
<td>X*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timed Up and Go (TUG)</td>
<td>X*</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>TUG Cognitive</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Highly Recommended

### Cognitive/ Dual Tasking

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kettle Test for Cognition</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montreal Cognitive Assessment (MoCA)</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medication management test</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini-mental exam</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroop color word test</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter digit substitution test</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory scanning Test</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trail Making Test A/B</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward and Backward Digit Span Test</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Vestibular

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dizziness Handicap Index</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### Neuropathy

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brief Peripheral Neuropathy Score</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified Total Neuropathy Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pain

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Analogue pain Scale</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Highly Recommended

### Mood

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression Anxiety Stress Scale (DASS)</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SF-36</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### Quality of Life

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Integration Questionnaire (CIQ)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EORTC: General and Brain tumor specific QLQ-C30 - BN20</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional Assessment of Cancer Therapy-Brain (FACT-Bv)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of Life after Brain Injury</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### Upper Extremity

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Hole Peg Test</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Action Reach Arm Test (ARAT)</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functional Reach</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxes and Blocks Test</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### Fatigue

<table>
<thead>
<tr>
<th></th>
<th>TBI</th>
<th>Strok</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>BORG</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>FACIT</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Multi-dimensional Fatigue Inventory (MFI)</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Fatigue Inventory</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
JHH CRP/BRP: Outcome Measures

<table>
<thead>
<tr>
<th>Tone</th>
<th>TBI</th>
<th>EDGE</th>
<th>Stroke</th>
<th>EDGE</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Ashworth Scale</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SLP Specific

<table>
<thead>
<tr>
<th>TBI</th>
<th>Stroke</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AMPAC

<table>
<thead>
<tr>
<th>Mobility</th>
<th>TBI</th>
<th>Stroke</th>
<th>JHH uses</th>
<th>Based on research</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADLs</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Interventions: Gait Training

- LiteGait
- NuStep
- Classic parallel bars

H-P Cosmos Treadmill with virtual reality component

Weighted Walker

Interventions: Orthotics/Prosthetics

L300 Foot Drop System

Estim Trigger

GivMohr Sling

Custom Ankle Foot Orthosis (AFO)

Interventions: Anaplastic Oligodendroglioma

R Sided Weakness, presenting like stroke patient

Case Example: Anaplastic Oligodendroglioma

PT provided consent for use of scans

T2 Sagittal MRI 2/15

T2 FLARE MRI Pre-op 7/13

TI Coronal MRI post-op 3/14

TI Coronal MRI 10/14

Case Example: Hemangioblastoma

Involvement of posterior fossa (cerebellum) leads to balance, vestibular, and gait deficits.

PT provided consent for use of scans
Case Example: Vestibular Schwannoma

Involvement of Cranial Nerve VIII leads to balance, vestibular, and gait deficits.

Interventions:
- Balance/ Vestibular/ Vision
- VOR X1: Horizontal
- VOR X1: Vertical
- VOR X2: Horizontal
- Can be performed in sitting or standing

Interventions:
- Foam
- Tracking
- Gaze Stability
- Single leg stance
- Eyes Open
- Eyes Closed

Community Integration

Presented by
Meghan Moore PT, DPT, STAR/C
Department of Physical Medicine and Rehabilitation
Johns Hopkins Hospital

Return to…….
- Work
- Childcare
- School
- Family Activity
- Competitive Sports
- Recreational exercise

- Limited research to address the long term effects affecting the ability to perform everyday life activities (Kahn 2013)
- Determine clearance from primary team: Neurosurgery and/or Oncology
- Discuss with BRP multi-disciplinary team
- Consider:
  - Time since surgery
  - Prognosis
  - Feasibility
  - Safety
  - Needs from BRP team to complete patient’s goal

Return to Driving

- State Dependent
- MD clearance needed
- Good to have protocol for OP setting because this is a huge priority/goal for many patients

JHH BRP:
- Provides handout for patient/family with “Who, What, Where, Why, How” of Driver Rehabilitation
- OT recommends/ refers patient to see Driver Rehabilitation Specialist at a different facility via state Motor vehicle administration, AOTA or Association of Driver Rehabilitation Specialist websites/ phone numbers
- www.aota.org/practice/productive-aging/driving.aspx; 1-800-377-8555
Case Example:
55 yo male presents with slurred speech, severe nausea, dizziness, diagnosed with Glioblastoma (R temporal region) who underwent resection at OSH in another state complicated by R basal ganglia CVA. Transferred to JHH for oncology management.

**ACS:** Admitted to Neuro Critical Care Unit initially for CVA management → Medical Oncology service: started chemotherapy/radiation

**CIIRP:** Spent 4 wks in rehabilitation with SLP, OT, PT, neuropsych, Complicated by L leg DVT. Undergoing radiation concurrently in PM.

**OP:** Attended ONRP program for preparation for discharge home once radiation was complete. Stayed at Hackerman House during stay. Discharged from therapy to location closer to home.

**Palliative:** Involved throughout stay from ACS → OP

---

RESOURCES FOR PATIENTS AND FAMILIES

- American Brain Tumor Association
  - 800-886-2282 www.abta.org
- American Cancer Society
  - 800-227-2345 www.cancer.org
- The Healing Exchange Brain Trust
  - 877-252-8480 www.braintrust.org
  - T.H.E. Brain Trust runs online support groups and forums for discussion on all brain tumors for patients, providers, researchers, educators and caregivers
- Musella Foundation for Brain Tumor Research and Information
  - 888-295-4740 www.virtualtrials.com
  - Musella Foundation offers education, support (emotional and financial), advocacy and guidance to brain tumor patients. Videos, articles, online support groups, and information about fundraisers for brain tumor research.
- National Brain Tumor Society
  - 800-770-8287 www.braintumor.org

---

Questions?

Rose Madison
2/15/16

REFERENCES

https://www.youtube.com/watch?v=riTrfDg2U
Intro/ Background References

- CBTRUS factsheet [Internet]. 2015. 
- http://www.hopkinsmedicine.org/neurology_neurosurgery/expert_profiles/team_member_profile/EF49C2ECD225F9C3CA8C6E1
  AE888B62Henry_Brem

ACS References

- http://www.webmd.com/physical-medications-treat-seizures/page=3
- https://www.mountsinai.org/care/physical-therapy-resources/on-call-resources/mmsa.pdf
- http://www.micesta.org
- www.aan.org
- http://www.who.int/cancer/palliative/definition/en/
- http://www.medicinenet.com
- www.oncology.org; CIPN Fact Sheet, Wampler, M. 2006
- https://www.powermobilityalberta.wordpress.com/ICF
- https://www.cancerresearchuk.org/about/cancer/brain/treat/tumours/treatment/chemotherapy/chemotherapy-with-chemo
- www.braininjurymn.org/library/AGuideToBrainAnatomy.pdf
- https://www.cancerresearchuk.org/about-cancer/brain-tumour/treatment/chemotherapy/chemotherapy-drugs-for-brain-tumours
- https://www.healthcare.uiowa.edu/gec/tools/function/palliativePerformanc e.pdf
- http://www.hospicepatients.org/karnofsky.html
- http://www.machelnke.org/Preop_assessment/Exercise_files/PastedGrou p.jpg
- http://www.who.int/cancer/palliative/definition/en/
- http://learningcenter.apta.org/Student/CourseProgress.aspx?CourseID=9133d34-1-41-4bd-946-c0d13d4ce68&Attempt=0; “Hospice and Palliative Care: The Collaborative Role of Physical Therapy”
- Catt, Susan, Anthony Chalmers, and Lesley Fallowfield, “Psychosocial and supportive-care needs in high-grade glioma.” The lancet oncology 9.9 (2008); 884-891.

ACS Image Hyperlinks

  aids/ars-plus/translations/en/uk/479.png
- https://www.google.ai/search?q=arjo+walker&biw=1366&bih=623&tbm=isch&sa=1&ved=0ahUKEwjKvNcEcR7JAhXGvXKHMScJLQ4QkQg
  &dpr=1
- https://www.google.ai/search?q=beecy+board&biw=1366&bih=623&tbm=isch
  &sa=1&ved=0ahUKEwjKvNcEcR7JAhXGvXKHMScJLQ4QkQg&dpr=1
  &sa=1&ved=0ahUKEwjKvNcEcR7JAhXGvXKHMScJLQ4QkQg&dpr=1
  &sa=1&ved=0ahUKEwjKvNcEcR7JAhXGvXKHMScJLQ4QkQg&dpr=1
- http://www.mayoclinic.org/diagnoses-conditions/hyponatremia/expert-answers/low-
  blood-sodium/faq.20095465

Palliative/ Hospice References

- http://www.who.int/cancer/palliative/definition/en/
- http://www.apta.org/uploadedFiles/APTAorg/About_Us/Policies/HOD/He
  alth/RoleOfPInPalliativeCare_HOD_P06-11-14-11.pdf
- http://learningcenter.apta.org/Student/CourseProgress.aspx?CourseID=9133d34-1-41-4bd-946-c0d13d4ce68&Attempt=0; “Hospice and Palliative Care: The Collaborative Role of Physical Therapy”
- Catt, Susan, Anthony Chalmers, and Lesley Fallowfield, “Psychosocial and supportive-care needs in high-grade glioma.” The lancet oncology 9.9 (2008); 884-891.
Palliative / Hospice References


Inpatient Rehabilitation References


Inpatient and OP: StrokEDGE and TBI Edge


Home Health References

- Home health OASIS medicare

Outpatient Rehabilitation References

Outpatient Rehabilitation References

