Neuro Oncology Rehabilitation

Maintaining Function and Quality of Life

Romer B. Orada, DO, FAAPMR
Cancer Physiatrist
Physical Medicine and Rehabilitation
Cancer Patient Support Center

Miami Cancer Institute
Disclosures

No relevant financial relationship(s) exist
Objective

Discuss Gap in Rehabilitation Care of Cancer Patients

Review Model of Rehabilitation in Continuum of Cancer Care

Highlight Brain Cancer (Tumor types, Treatments, etc.)

Discuss Rationale of Rehabilitation in Patients with Brain Cancer

Provide (some) Examples of Impairments in Brain Cancer

*Age-adjusted to the 2000 US standard population.
Source: National Center for Health Statistics, Centers for Disease Control and Prevention, 2019.
Jan 2019 - 16.9 million (5% of the population) Projected to increase by >54%, to 26.1 million by 2040.

# Trends in Five-year Relative Survival Rates (%), 1975-2015

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>All sites</td>
<td>49</td>
<td>55</td>
<td>69</td>
</tr>
<tr>
<td>Breast (female)</td>
<td>75</td>
<td>84</td>
<td>91</td>
</tr>
<tr>
<td>Colorectum</td>
<td>50</td>
<td>60</td>
<td>66</td>
</tr>
<tr>
<td>Leukemia</td>
<td>34</td>
<td>43</td>
<td>66</td>
</tr>
<tr>
<td>Lung &amp; bronchus</td>
<td>12</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>Melanoma of the skin</td>
<td>82</td>
<td>88</td>
<td>94</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>47</td>
<td>51</td>
<td>75</td>
</tr>
<tr>
<td>Ovary</td>
<td>36</td>
<td>38</td>
<td>48</td>
</tr>
<tr>
<td>Pancreas</td>
<td>3</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Prostate</td>
<td>68</td>
<td>83</td>
<td>99</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>72</td>
<td>79</td>
<td>78</td>
</tr>
<tr>
<td>Brain/CNS</td>
<td>22</td>
<td>29</td>
<td>33</td>
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Source: Surveillance, Epidemiology, and End Results (SEER) Program, National Cancer Institute, 2019.
Gap in Rehabilitation Care in Cancer Patients

- Rates of physical impairment vary across survivorship populations.

20% Childhood Survivors

53% Adult Survivors
Gap in Rehabilitation Care in Cancer Patients

- Impairments and symptoms -> decrease quality of life, function, work capacity -> increase in healthcare utilization

- Despite the amount of cancer-related impairment, referral rates for even simple/treatable physical impairments are only reported to be as low as 1-2%
What makes Cancer Rehab unique?
What makes (Brain) Cancer Rehab unique/different?

![Graph showing function over time with an event and intervention]

What makes (Brain) Cancer Rehab unique/different?

- Medical acuity of patients
- Extensive comorbidities
- Ongoing nature of disease /*Dynamic lesions*/
- Demands for cancer-directed treatments
- Large number of steroid myopathy, peripheral neuropathy patients, and asthenic patients
- Cancer symptoms i.e. significant pain, extreme fatigue, cachexia
- Reduced life expectancy
What makes (Brain) Cancer Rehab unique/different?
Model of Rehabilitation in Continuum of Cancer Care

-Dietz Classification, 1969-

Preventive – intervening early on in anticipation of potential impairment
Restorative - returning to pre-morbid status
Supportive - supporting patients through the decline
Palliative – assisting in symptom control and preventing complications

Diagnosis  Surgery  Radiation  Chemotherapy
Prevention  Active Treatment  Survivorship

“Prehab”  Restorative  Supportive
Palliative

Epidemiology of Brain Cancer

~700,000 with primary brain tumor in the US
-nearly 80,000 diagnosis this year
-~ 1/3 are malignant

~18,020 projected deaths ~3.0% of all cancer death rates (2020)
-Median age = 60 years old (2nd mcc in those 0-14yrs)
-5 year relative survival ~ 32.6% (2010-2016)
Risk Factors for Brain Cancer

-Age, genetics, and environmental

Environmental:

-Many potential risk factors…
  -Exposure to ionizing radiation

Genetic (Hereditary, familial syndromes):

-5-10% are passed down from one generation to the next
Brain Tumor Types

- Gliomas – most common – 40% of all primary brain tumors

- Meningioma - 30% of all primary brain tumors

- Tumors included in the glioma category:
  - Astrocytomas (includes GBM)
  - Oligodendrogliomas
  - Ependymomas

- Pituitary tumors - typically benign ~16%

- Lymphomas and Oligodendrogliomas ~2%

- Medulloblastomas ~1%
Brain Tumor Types

- Gliomas - highest mortality rate - median survival rate of 12-15 months

- GBM account for ~15% of all primary tumors and ~55% of all gliomas

- Two types (primary vs. secondary)

- Adults (cerebral hemispheres or brain stem) vs. Children (pons)
Brain Tumor Types

- Brain metastases - L, B, M, C, and RCC are the mc primary

- 80% presents as multiple tumors vs. 15-20% as single lesion

- 85% of metastatic lesion -> cerebrum and 15% -> cerebellum

- IPR admissions:
  - 20%-30% GBMs
  - 20% meningiomas
  - 25%-30% due to metastatic disease
Diagnosis

Presenting symptoms:
- Most common – Headache
- Seizures
- Focal neurological deficits
## Diagnosis

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>HIGH-GRADE GLIOMA</th>
<th>LOW-GRADE GLIOMA</th>
<th>MENINGIOMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seizures</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Focal neurological dysfunction (e.g., hemiparesis, visual field cut, hemisensory loss, aphasia)</td>
<td>+++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Cognitive/behavioral changes</td>
<td>++</td>
<td>–</td>
<td>+</td>
</tr>
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</table>
Diagnosis

Imaging
- Structural MRI – with IV gadolinium contrast std for diagnosis

Biopsy
- When imaging is inconclusive or needs confirmation
Medical Management

-Steroids - nearly all will receive steroids during their disease

-Helps minimize symptoms (i.e. due to vasogenic edema)

-Dexamethasone steroid of choice

-Goal is to taper to min effective dose

-Potential complications
  -steroid-induced myopathy, insomnia, anxiety, psychosis/agitation, hyperglycemia, wt gain
Medical Management

- Seizure management
- Tumor control
- AEDs

-DVT/PE risk management

- Occurs in 3-20% of glioma patients (up to 60% in GBM)

- LMWH, unfractionated heparin, direct Xa inhibitors (rivaroxaban)
Cancer Directed Treatment

-Surgical Resection:

-patients with significant disease burden

-RCTs - surgery of single brain met increases survival
Cancer Directed Treatment

- Radiation Therapy (RT):

  - Whole Brain RT (WBRT) - extensive metastatic disease

  - WBRT less favorable

- Stereotactic Radio Surgery (SRS)

  - Radionecrosis ~20% after initial SRS

  - RT toxicities: hair loss, poor appetite, fatigue, cerebral edema, and headaches


Cancer Directed Treatment

-Chemotherapy:

-First line - Temozolomide (Temodar) - oral alkylating agent
- High grade gliomas (GBMs)

-Side effects:
- mod-to-sev thrombocytopenia (10%–20%), lymphopenia and neutropenia (15%)
- nausea, fatigue, anorexia, and hepatotoxicity (rare)
Cancer Directed Treatment

-Chemotherapy:

-Bevacizumab (Avastin) – monoclonal Ab/anti-VEGF

-Recurrent GBMs

-Management of vasogenic edema

-Side-effects:

-HTN, VTE, bleeding, and delayed wound healing
## Cancer Directed Treatment

### Brain Tumor Initial Treatment

<table>
<thead>
<tr>
<th>Low-Grade Glioma (low risk: young, completely resected, no symptoms)</th>
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<tbody>
<tr>
<td>Surveillance imaging only</td>
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<table>
<thead>
<tr>
<th>Glioblastoma Multiforme</th>
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<tbody>
<tr>
<td>Maximal surgical resection</td>
</tr>
<tr>
<td>Focal radiation therapy + concurrent temozolomide</td>
</tr>
<tr>
<td>Adjuvant temozolomide</td>
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<table>
<thead>
<tr>
<th>Meningioma</th>
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</thead>
<tbody>
<tr>
<td>Surgical resection</td>
</tr>
<tr>
<td>Focal radiation therapy</td>
</tr>
<tr>
<td>Stereotactic radiosurgery</td>
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</tbody>
</table>
Rationale for Rehabilitation in Brain Cancer

- Multiple medical and functional impairments for the survivor
- Based on baseline functional status and tumor-related impairments
- Benefits

Specific Impairments in **Brain Cancer**

- Cognitive Dysfunction
- Aphasia and Dysphagia
- Activities of Daily Living
- Mobility
- Spasticity
- Pain
- Fatigue
- Bowel/Bladder
Cognitive Dysfunction

Deficits from pathology + treatment → progressive

- ~30% after surgical intervention, up to 90% long term

- Mechanism: RT-induced – neuronal inflammation and degeneration of hippocampus (Temodar through the same mechanism as well)

- Concentration, multitasking, word finding, and difficulty remembering names and numbers


Cognitive Dysfunction

- Interventions – adaptive or restorative approach (or both)
- Focus on daily activities
- Consider decision-making capacity
- Neuro-stimulants?


*Aphasia
~ 30%-50% of patients will have aphasia

*Dysphagia
- Retrospective study: 63% of brain tumor and 73% of CVA on IPR admission
- 50% were consuming regular diet at discharge
- ~85% of had dysphagia toward the end of life.

*Treatment should be similar following CVA
### Activities of Daily Living

**Objective measure of patient's current functional status**

**Basic activity of daily living (BADL)** - bathing, dressing, toileting

**Instrumental activities of daily living (IADL)** - finances, shopping, using electronics

**Oncologists use** Karnofsky Performance Scale (KPS) - only accounts for BADL.

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### ECOG Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Percent</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Capable of carrying out a normal physical activity without restrictions.</td>
<td>100</td>
<td>Normal condition, no symptoms or evidence of illness.</td>
</tr>
<tr>
<td>1</td>
<td>There are symptoms but without hospitalization. Restriction on vigorous physical activities, but an outpatient and able to undertake light and sedentary activity.</td>
<td>80</td>
<td>Normal activity with effort. There are some symptoms or indications of illness.</td>
</tr>
<tr>
<td>2</td>
<td>In bed less than 50% of the time, not hospitalized, able to care for self, but unable to work more than 50% of the time when out of bed.</td>
<td>60</td>
<td>Needs occasional assistance, but able to supply the greater part of his or her personal needs.</td>
</tr>
<tr>
<td>3</td>
<td>Capable of personal care, but has to spend in a bed or chair more than 50% of the time.</td>
<td>40</td>
<td>Bedridden patient, requiring assistance and special care.</td>
</tr>
<tr>
<td>4</td>
<td>Completely incapable of any effort, totally confined to bed.</td>
<td>20</td>
<td>A grave condition, intensive support, patient requires hospitalization.</td>
</tr>
<tr>
<td>5</td>
<td>Death.</td>
<td>0</td>
<td>Death.</td>
</tr>
</tbody>
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Mobility

-Safety is priority

-Transfer training – patient’s diagnoses and impairments

-Bed mobility, transfer in/out of bed/wc, toilet, shower, etc.

-Consider mechanical lift, transfer board, etc in worsening disease status
Mobility

-Gait training – affects motor control and/or planning

-Gait impairments, i.e. ataxia (especially with cerebellar involvement)

-Assistive device, consider aquatic therapy

-Exercise!


Spasticity

- Incidence of 6% vs. CVA (19-39%) and TBI (34%)

- TENS and NMES

- Serial casting

- Positioning – use of splints

- Multimodal approach

- May use systemic treatment

- Intrathecal baclofen for severe cases
Pain

- Headache – most common
- Somatic/nociceptive pain
- Somatic vs. neuropathic treatments
- Chronic pain
- Non-pharmacologic
- Manual therapies
- Repositioning and pressure reliefs


Fatigue

- >80% of brain cancer patients experience CRF during treatment

- 89%-94% with recurrent malignant gliomas and 39% low grade gliomas

- Consider multifactorial etiology

- Consider multimodal Strategies
Bowel and Bladder

Bowel management – importance of maintaining continence and QoL

- UMN bowel – can be managed with bowel regimen
- Incontinence can be improved with schedule

Neurogenic bladder – hypotonic (flaccid) or spastic bladder

- Imperative to limit vesicoureteral reflux and decrease risk of UTI/RD
- IC preferred over IF to minimize infection risk(s)
- Continence helps protect skin integrity and embarrassment
Long Term Sequelae

- Neurocognitive Dysfunction

- CVA
  - postop incidence 19% to 64%

- RT necrosis
  - typically develops 1-3 years after treatment

- Secondary cancers
  - risk factor for meningiomas, malignant gliomas, and nerve sheath tumors
  - incidence is 8.1-52.3x higher childhood survivors


Challenge of Brain Cancer Rehab...
Conclusion

-Multiple medical and functional impairments for the survivor

-Impairments can be substantial

-Goal - objective, realistic and attainable (must involve caregivers)

-Similar to other intracranial process - but can be very challenging due to the dynamic nature of the disease

-Communication is key