Assessment and Treatment of High Level and Low Level Cognitive Deficits

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This presenter has no conflict of interest to report regarding any commercial product/manufacturer that may be referenced during this presentation.

Objectives

1. Identify the prevalence of cancer-treatment related cognitive changes
2. Discuss additional factors contributing to cognitive dysfunction related to cancer survivorship
3. Identify the occupational therapy assessment tools that can be used with clients who have cancer-related cognitive dysfunction
4. Describe the various occupational therapy treatment approaches for addressing cognitive dysfunction in patients with cancer
Prevalence of Cognitive Dysfunction Resulting from Cancer

• Up to 75% of patients with cancer experience cognitive impairment during or after cancer treatment\(^1\)
  – Memory, executive functioning, attention deficits

• Nearly 4 million cancer survivors have some form of cognitive difficulty\(^1,2\)

• Cognitive impairments resulting from cancer related treatment vary
  – Subtle or dramatic
  – Temporary or permanent

Pediatric and Adolescent Patients with Cancer \(^3,4\)

• 1 in 570 young adults between the age of 20 - 34 years is a childhood cancer survivor

• Cranial radiation and chemotherapy are associated with neurocognitive deficits

• Neurocognitive dysfunction is most common with:
  – Acute Lymphoblastic Leukemia (ALL)
  – Solid tumors involving the CNS

• Damage to cortical and sub-cortical white matter is most commonly cited in the literature
  – Results in impaired processing speed, visual spatial and visual motor skills

Older Adults with Cancer\(^5,6\)

• Approximately 60% of new cancers are diagnosed in older adults >65 years of age in the US

• Chemotherapy-related cognitive impairment is underdiagnosed in the older adult population
  – Depression may be a confounding factor

• Older adults may be more vulnerable to cognitive changes as a result of cancer treatment
  – Cognitive reserve
  – Cognitive capacity
  – Resiliency vs. vulnerability
Patients with Brain Tumors

- In 2010 more than 688,096 people in the U.S. were living with the diagnosis of a primary brain or central nervous system tumor
  - Approximately 70,000 new cases of primary brain tumors will be diagnosed this year
- Approximately 5% of patients who receive radiation therapy for a brain tumor develop radiation necrosis
- Negative treatment effects on the CNS may lead to cognitive dysfunction
  - Focal radiation necrosis (inflammation)
  - Cerebral edema
  - Diffuse leukoencephalopathy
  - Acute vs. late toxicities

Patients with Prolonged Hospitalization

- 60-80% of patients requiring mechanical ventilation in the ICU experience delirium
- ICU survivors report persistent difficulty with concentration, memory and executive function
  - 1/3 or more have long-term cognitive impairment
  - 46% of patients with ARDS present with cognitive impairment 1 year after hospital discharge; 25% have deficits 6 years later
- There is a higher incidence (23-41%) of depression, anxiety, and PTSD in ICU survivors which negatively impacts cognitive function

Patients with Breast Cancer

- There are currently 2.6 million breast cancer survivors in the US
- Multimodality cancer treatment leads to cancer treatment associated cognitive changes
  - Surgery, exposure to general anesthesia, radiation therapy, hormone therapy, chemotherapy
- Mild cognitive impairment is one of the most common symptoms reported by breast cancer survivors
  - Reported in 17 to 75% clients with breast cancer
Risk Factors Associated with Cognitive Dysfunction

• The risk for post-treatment cognitive problems is potentially a combination of several factors:
  – Age
  – Cognitive reserve
  – Genetics
  – Lifestyle (education level, occupation)
  – Environmental exposures
  – Specific cancer treatments

Additional Contributing Factors

• Disease process or progression of disease
• Physiological effects of chemotherapy and radiation
• Direct effects of cancer and/or cancer treatment on CNS
• Pain
• Fatigue
• Depression/anxiety
• Limited or ineffective:
  – Strategy use
  – Problem solving skills
  – Understanding of the causes of cognitive impairment

Physiological Effects of Cancer Treatment on Cognition
Effects of Chemotherapy

- Animal studies demonstrate the negative effects of chemotherapy on brain function:
  - Inhibition of hippocampal neurogenesis
  - Oxidative damage
  - White matter damage
  - Decreased hypothalamic-pituitary-adrenal axis activity
  - Reduced brain vascularization and blood flow

Effects of Radiation Therapy

- Animal studies demonstrate radiation-induced neurotoxicity:
  - Prolonged reduction in cell proliferation
  - Depressed neurogenesis
  - Vascular injury
- Toxicity from brain tumor therapy (RT) can range from focal neurological deficits to generalized neurological syndromes:
  - Decreased cognitive function
  - Fatigue, weakness, impaired balance
  - Altered safety awareness

Effects of Steroids and Sedatives

- Steroids:
  - Function to decrease edema in the brain
  - May contribute to cognitive impairment, insomnia, fatigue, hyperglycemia and tremors
  - Delay healing and contribute to wound infections
- Sedatives:
  - Contribute to insomnia and drowsiness
  - Alter level of arousal
  - Delay healing
Cancer Associated Cognitive Impairments

Chemotherapy
- Inattention
- Lack of concentration
- Decreased working memory
- Impaired executive functioning

Radiation Therapy
- Inattention
- Decreased memory
- Impaired executive functioning
- Impaired visual/perceptual skills

Steroids
- Behavioral changes
- Decreased verbal memory
- Inattention

Sedatives
- Decreased level of arousal
- Delirium
- Confusion/disorientation

Current Methods to Measure Cognitive Function

- Subjective: Based on clients’ perceptions of cognitive function deficit and the functional impact through structured interview
  - Mild cognitive impairment is one of the most common symptoms reported by survivors after breast cancer treatment

- Objective: Based on objectively documented deficits in cognitive performance on neuropsychological tests
  - Research using neuropsychological tests indicates chemotherapy effects executive function, processing speed, attention/concentration, and verbal/visual memory
Subjective Assessments – Neuropsychology

- Self-report questionnaires
  - European Organization for Research and Treatment of Cancer Quality of Life (EORTC QLQ-C30)
  - Cognitive Failures Questionnaire (CFQ)
  - Cognitive Function Scale and Questionnaire for Self-perceived Deficits in Attention (FEDA)
- Perceived cognitive impairment is strongly associated with fatigue, anxiety, and depression
  - Clinical assessment of fatigue and sleep patterns is necessary
  - Diagnosis of anxiety vs. depression

Objective Assessments - Neuropsychology

- Mini-Mental State Examination (MMSE)
- High Sensitivity Cognitive Screen (HSCS)
- Visual reproduction
  - Immediate and delayed recall
- Word fluency
- Block design
- Stroop test

Barriers to Accurately Assessing Cognitive Dysfunction

- What is the patient’s normal range of functioning on a neuropsychology test?
- Is neurocognitive testing sensitive enough to detect subtle deficits?
- Has the patient experienced a change in cognitive functioning prior to the cancer diagnosis or cancer treatment?
The Role of Occupational Therapy

Occupational Therapy Evaluation Methods

- Cognitive Evaluations
  - Montreal Cognitive Assessment (MOCA)
  - Test of Everyday Attention
  - River-mead Behavioral Memory Test

- Performance Based Cognitive Assessments
  - A-ONE
  - Executive Function Performance Test
  - Multiple Errands Test

- Occupation Based Assessments
  - Canadian Occupational Performance Measure (COPM)
  - Model of Human Occupation Screening Tool (MOHOST)

Montreal Cognitive Assessment (MOCA)¹⁴

http://mocatest.org/permission.asp
Treatment Approaches for Cancer Associated Cognitive Impairment

- Neuro-anatomy based treatment approach
- Restorative/remedial approach
- Cognitive compensatory approach
- Self-management approach

Neuro-Anatomy Based Approach

- Theory based approach
- Dysfunction at this level can be associated to a very specific lesion in the brain
- Strategies (usually adaptive) can be used to resume or improve function
  - Strategies focus on activity analysis and task/cue simplification
  - Divide tasks into component parts that can be taught/learned

Restorative/Remedial Approach

- Remediate impairment with exercises and strategies
- Drills, computer games
- Attention process training (ATP)
- Cognitive or task “shifting”
- Limited functional application and not 100% occupation based
Compensatory Approach\textsuperscript{15}

- Compensatory/adaptive strategies are used to facilitate improved cognitive function

- Strategies for compensation can be applied to a specific skill or functional task

- Use a patient's strengths to achieve successful occupational performance
  - Ensure that strategy-use is functional and meaningful for each patient

Compensatory Approach Strategy Training\textsuperscript{15}

- Mental rehearsal
  - Improves planning and self regulation

- Self instructional strategies
  - Verbalizing self cues and task goals
  - Improves concentration/focus

- Visual imagery and self monitoring

- Task reduction
  - Activity simplification by breaking down an activity into smaller manageable tasks

- Minimize distractions

Self Management Approach\textsuperscript{15,16}

- Focus on:
  - Problem solving
  - Action planning/goal setting
  - Facilitate open communication
  - Minimize anxiety to enhance confidence
  - Promote social learning in group format with others who have similar experiences or conditions
Self Management Approach\textsuperscript{15,16}

- Questions to guide self reflection:
  - What do I have the most difficulty with?
  - What is the severity of the problem?
  - What strategies or modifications can I use to alter my performance?

- Encourage self monitoring during and after completion of a task
  - “Check in” or “self check”
  - Anticipate difficulties and generate alternate strategies

Self Management Components\textsuperscript{16}

- Drug and symptom management
- Management of anxiety/depression/fatigue levels
- Life style modifications
  - Exercise
  - Healthy diet
  - Regulating sleep routine
  - Social support
  - Communication
  - Action planning

Cognitive Behavioral Strategies
- Coping skills/relaxation
- Sleep hygiene and education
- Self-regulation management

Compensatory Skills Training
- Strategy use for completing tasks differently
- Modify behaviors and environment

Remediation/Restoration
- Cognitive “shifting”
- Computer based training
- Practice, practice, practice
- Relevant real-life tasks

Exercise & Activity Participation
- To promote and maintain focus/concentration
- Stress management

Comprehensive Cognitive Rehab Approach

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Challenges in Selecting Cognitive Treatment Interventions

- The patient needs to be capable of cognitive learning
- Does the patient have insight into his/her deficits?
- Is the patient willing to take ownership for his/her cognitive program?
  - Can the patient dedicate practice time to novel restorative and compensatory strategies?
- Are there other confounding problems?
  - Pain, anxiety, depression, etc.

Possible Solutions

- Focus on strategy training instead of solely on task mastery (the how instead of the what)
- Cognitive strategy training in real-life contexts
- Patient centered/focused
  - INDIVIDUALIZED program
- Encourage problem solving and action planning

Case Example – Patricia

- 55 year old female diagnosed with Acute Myeloid Leukemia (AML)
- 7th grade science teacher (on medical leave)
- Cancer treatment:
  - Induction/consolidation chemotherapy
  - Admitted for a Double Cord Blood Transplant (DCBT)
  - Hospitalized for 3 months for treatment/medical complications
**Acute Care Evaluation and Discharge Status**

**EVALUATION (prior to transplant):**

<table>
<thead>
<tr>
<th>Cognition</th>
<th>MOCA score 27/30</th>
</tr>
</thead>
<tbody>
<tr>
<td>BADL performance</td>
<td>Independent</td>
</tr>
<tr>
<td>Strength/coordination</td>
<td>Intact</td>
</tr>
</tbody>
</table>

**DISCHARGE STATUS:**

<table>
<thead>
<tr>
<th>Cognition</th>
<th>MOCA score 26/30 <strong>Impaired focus, attention, memory</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>BADL performance</td>
<td>Supervision with dressing Min A with showering</td>
</tr>
<tr>
<td>Strength/coordination</td>
<td>Impaired hand strength/FM coordination</td>
</tr>
</tbody>
</table>

**Outpatient Occupational Therapy Goals**

- **Short term goals (4 weeks)**
  - Pt. will be modified independent with making her bed and sorting through mail/bills to complete IADL tasks daily.
  - Pt. will demonstrate increased FM coordination to increase writing tolerance with sending thank you cards and manipulating daily medication.

- **Long term goals (8 weeks)**
  - Pt. will be independent with summarizing a short magazine article, and counting the number of times a word appears in the article to demonstrate improved attention/focus.
  - Pt. will be independent with a HEP (hand strengthening and cognitive activities) for increased independence with paying bills on time, creating lesson plans, and medication management.
Outpatient Occupational Therapy Interventions

- Compensatory strategies
  - Energy conservation techniques; task simplification
  - Equipment/environment modifications; shower chair
  - Activity log; writing things down
  - Minimizing distractions
- Restorative activities
  - Reading and summarizing content
  - Graded/increased time spent reading and writing
  - Creating sample lesson plans
- Self management strategies
  - Goal setting/action planning

With a Decline in Function...Acute Care Occupational Therapy Interventions

- Compensatory strategies
  - Minimizing distractions in the environment
  - Following simple 1-2 step directions
  - Cue simplification for self care and transfers
- Restorative activities
  - Repetitive practice of simple tasks (grooming and oral care with adequate concentration)
  - Recalling sequence for safe transfer to chair – patient verbally recites the steps
  - Daily orientation and recall questions

Conclusion

- Cognitive dysfunction resulting from cancer treatment requires a combination of intervention approaches
  - Compensatory, restorative and behavioral modification
- A patient-focused approach is necessary for carryover
  - The patient needs to be an active participant.
  - Emphasis on meaningful and real-life tasks leads to improved occupational performance
References