Functional Rehab for Cancer Survivors

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Objectives

- Identify function related side effects of cancer and cancer treatment
- Understand causes and symptoms of those side effects
- Identify Rehab specific issues in survivorship and functional implications of those issues
- Review global and specific interventions therapists use to assist for each issue
- Identify literature, research and evidence of effectiveness of therapy to treat issues in survivorship
Therapy Referrals in Survivors

- **Anatomic**
  - Range of motion deficits
  - Radiation fibrosis
  - Limb dysfunction
- **Functional**
  - ADLs/Independence
  - Balance/mobility
- **Psychosocial**
  - Anxiety
  - Depression
  - Pain
  - Strength
  - Dysphagia
  - Fatigue
  - Cognition
  - QOL
  - Return to work
Statistics

- Lehman, et al. found: 438 out of 505 patients surveyed reported impairments and/or functional limitations
  - Including (But not limited to)
    - Psychiatric
    - Weakness
    - ADLs
    - Pain
    - Balance
    - Housing/social
Rehabilitation through the cancer spectrum

<table>
<thead>
<tr>
<th>Phase of cancer</th>
<th>Patient needs</th>
<th>Symptoms</th>
<th>Impact of symptoms on function</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Pretreatment and evaluation</td>
<td>Information about treatment options and impact of illness</td>
<td>Pain, Anxiety, Depression</td>
<td>Daily routines, Sleep/Fatigue</td>
</tr>
<tr>
<td>II. Treatment</td>
<td>Information</td>
<td>Pain, Anxiety, Depression, Pain, Anxiety, Loss of mobility, Wound/Skin care, Speech/Swallowing</td>
<td>Daily Routines, Sleep/Stamina, Self-care, Comesis, Communication</td>
</tr>
<tr>
<td>III. Posttreatment</td>
<td>Support, Rehabilitation intervention</td>
<td>Pain/Weakness, Anxiety/Depression, Loss of mobility, Edema, Fatigue/Stamina</td>
<td>Sleep/Fatigue, ADL, Vocational/Avocational, Cosmesis</td>
</tr>
<tr>
<td>IV. Recurrence</td>
<td>Education, Support, Rehabilitation intervention</td>
<td>Pain/Weakness, Anxiety/Depression, Fatigue/Stamina, Edema, Edema, Bony instability, Anorexia</td>
<td>Sleep/Fatigue, Disability, Disruption of routines, Cosmesis, Vocational/Avocational</td>
</tr>
<tr>
<td>V. End of life</td>
<td>Education, Support, Palliative rehabilitation</td>
<td>Pain, Fatigue, Anorexia</td>
<td>Dependence, Immobility</td>
</tr>
</tbody>
</table>

ADL: activities of daily living.
Rehab Issues in Survivorship

- Cancer Related Fatigue
- Radiation induced Fibrosis
- Peripheral neuropathy (specifically CIPN)
- Lymphedema
- Incontinence
- Osteoporosis
- Cognition
Cancer Related Fatigue

“No amount of sleep I get will be enough. That feeling people have first thing in the morning after a bad sleep is what I have all day, every day.”

— Calliope Krystal Pia Kilpeläinen

“It’s like swimming upstream every moment you’re awake.”

— Oriana Hill
Cancer Related Fatigue (CRF)

• National Comprehensive Cancer Network defines cancer-related fatigue as "a distressing persistent, subjective sense of physical, emotional and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning".
Cancer Related Fatigue

**Causes:**
- Local or distant effects of tumor
- Treatment toxicities
  - Radiation
  - Chemotherapy
  - Biotherapy

**Importance:**
- Function/ADLs
- Affects return to work
- Quality of Life
- Social Participation

**Can lead to:**
- Muscle wasting
- Further decreased endurance
- Depression
Cancer Related Fatigue

- **Treatment**
  - **Aerobic Conditioning**
    - McNeely, et al found beneficial. Improving Peak O2 consumption and Peak power output
  - **Energy conservation**
    - Planning
    - Delegating
    - Resting
    - “Spoon Theory”
    - “Envelope theory”
    - Setting priorities
    - Pacing
    - Scheduling
Spoon Theory

Good morning! Here’s to another brand new day!
In your hands are 15 spoons.
Each spoon represents the energy needed to complete a part of your daily routine.
Once you’re out of spoons, you’re out of energy. But don’t worry, tomorrow always brings more spoons.

This is the spoon theory, an everyday reality for those who live with a chronic illness.

UNDERSTANDING CHRONIC ILLNESS THROUGH THE SPOON THEORY

So, how would you like to use your spoons today?

- get out of bed
- take a shower
- visit your doctor
- grocery shopping
- call your parents
- manage meds
- walk your dog
- take kids to school
- get dressed
- make dinner
- socialize
- go to work

For more information please visit www.MollysFund.org.
Radiation Induced Fibrosis

“Biological Rust”
Radiation Induced Fibrosis (RIF)

- **Definition:**
  - Fibrotic tissue - faulty collagen remodeling due to uneven cellular division of fibroblasts that produce collagen.
  - Normal tissue is replaced by mesenchymal (embryonic mesoderm) cells.

- Subcutaneous tissue hardening occurring after radiation treatment = Radiation Fibrosis Syndrome (RFS)

*May happen *months to years* after completion of radiation treatments.*
Radiation Induced Fibrosis

1. Overproduction of pro-inflammatory cytokines
2. Fibroblast proliferation
3. Excessive extracellular matrix deposition
4. Inflammatory infiltrate (exudate)
5. Fibrosis
Radiation Induced Fibrosis

- **Causes:**
  - Radiation
    - Most commonly for:
      - Head and neck
      - Breast
      - GI and GU
      - Soft tissue sarcomas

- **Locations:**
  - Connective tissues
    - Skeletal muscles
    - Cardiac muscles
    - Adipose tissue
    - Parenchymatous organs
      - Lungs
      - Cartilage
      - Bone
Radiation Induce Fibrosis

- Look and feel:
  - Skin texture
    - Dense
    - Hard
    - Uneven
    - Inelastic
  - Palpable mass
  - “Playdough” consistency
# Radiation Induced Fibrosis

<table>
<thead>
<tr>
<th>Prefibrotic</th>
<th>Organized fibrosis</th>
<th>Late fibroatrophic</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Chronic inflammation</td>
<td>- Patchy areas of active fibrosis with high density of myofibroblasts</td>
<td>- Retractile fibrosis</td>
</tr>
<tr>
<td>- Endothelial cells plays important role</td>
<td>- Dense sclerotic matrices</td>
<td>- Loss of parenchymal cells</td>
</tr>
</tbody>
</table>
Radiation Induced Fibrosis

Patient symptoms

- Decreased ROM
- Decreased strength
- Pain
- Tightness or stiffness
- Loss of skin elasticity
- Rigidity
- Retraction of surface contours

- Swelling of limbs or Lymphedema
- Numbness/altered sensation
- Decreased ADL performance or participation

**Risk and severity is determined by:**
- Dose, fractions, time and field treated by radiation
- Surgery
- Chemo
- Age
- Physiological status and comorbidities
Radiation Induced Fibrosis Therapy Treatments

- Focus on ROM and stretching
  - Soft tissue mobilization/ Self massage
  - Joint mobilization
  - Myofascial Release
- Pain control
  - Modalities
    - E stim
- Strengthening exercises
- Education
  - HEP
  - Recognizing symptoms

*Keep in mind:
- Lymphedema:
  - Patient should be referred to lymphedema specialist immediately
  - Applying pressure over fibrotic tissue does not cause pitting, lymphedema may or may not pit.
- Post Lymph node dissection:
  - Avoid extreme hot or cold and/or deep pressure (massage)
Peripheral Neuropathy
Peripheral Neuropathy

• Definition:
  ▫ Injury, inflammation, or degeneration of peripheral nerve fibers
  ▫ Feet and hands can be affected
  ▫ Chemo Induced Peripheral Neuropathy (CIPN)
    • Cancer treatment induced Neuropathy

• Incidence:
  ▫ Occurs in 1-20% of all cancer patients
  ▫ Occurs in >60% of patients receiving chemo (esp. NSCLC, MM, Leukemias, breast cancer)
  ▫ Strongest Immediately following Chemo
  ▫ Peak at 3-5 months after the last dose
  ▫ May disappear or lessen several months after peak
    • Some temporary, some symptoms could be permanent
Peripheral Neuropathy- CIPN

- **Causes**
  - **Side effects of drugs for cancer treatment**
    - Platinum based: cisplatin (Platinol), oxaliplatin (Eloxatin), carboplatin (Paraplatin)
    - Taxanes: pacilataxel (Taxol, Abraxane), docetaxel (Taxotere)
    - Vinca Alkaloids: vincristine (Oncovin, Vincasar), vinorelbine (Navelbine), and vinblastine (Velban)
    - Podophyllotoxins: etoposide (Etopophos, VePesid, Toposar, VP-16) and teniposide (Vumon)
    - Epothilones: ixabepilone (Ixempra)
    - Thalidomide (Thalomid) and lenalidomide (Revlimid)
    - Bortezomib (Velcade)
    - Interferon
    - Methotrexate (Rheumatrex, Trexall, Amethopterin, MTX)
    - Fluorouracil (5-FU, Adrucil)
    - Cytarabine (Cytosar-U)
Peripheral Neuropathy - CIPN

• Cancer related Causes (cont.)
  ▫ Surgery
  ▫ Radiation
  ▫ Tumor/mass effect on PNS
  ▫ Opportunistic Infections
  ▫ Cancer itself (multiple myeloma can cause Neuropathy)
  ▫ Chemicals released by tumors, (Tumor Lysis Syndrome, paraneoplastic syndrome, PND: Paraneoplastic neurologic disorders)
Peripheral Neuropathy - CIPN

- **Sensory** (Mostly)
  - Smaller nerve fibers compared to motor
  - Much less regeneration occurs b/c of this
  - 1st affected nerves
    - Longer nerve fibers have greater surface area allowing greater exposure to chemo drugs, which is why it starts in fingers/toes and travels distal to proximal
  - Cell bodies are outside of the protective BBB, making them more vulnerable to the effects of chemo

- **Motor and Autonomic** (Less common)
  - Less affected
  - Have a greater ability to regenerate
  - Autonomic nerves = less sensitive to overall chemo-toxicity

*Mechanisms vary depending on the chemotherapy agent
*Exact mechanism is not exactly defined in the literature
Peripheral Neuropathy - CIPN

- **Symptoms:**
  - Sensory: Most common in hands and feet
    - Numbness/tingling
    - Burning, stabbing, shooting, sharp, electrical pain
    - Sensitivity to cold (hyperalgesia)
    - Pain to light touch
    - Pain with ambulation
    - Loss of proprioception

- **Leads to:**
  - Coordination deficits
    - Fine motor
  - Decreased ADL independence
  - Difficulty sleeping
  - Decreased QOL
  - Falls
    - Caused by decreased balance, sensation, proprioception
  - **Motor Deficits (less common)**
    - Weakness
    - Muscle fatigue
    - Loss of deep tendon reflexes.

*May occur quickly or progress over time.*
Peripheral Neuropathy - CIPN

**Sensory Symptoms**
- Paresthesia
- Hyperesthesia
- Hypoesthesia
- Dysesthesia
- Pain
- Numbness and tingling
- Hyporeflexia or areflexia
- Diminished or absent proprioception
- Diminished or absent vibratory sensation
- Diminished or absent cutaneous sensation
- Diminished or absent sense of discrimination between sharp and dull

**Motor Symptoms**
- Weakness
- Gait disturbance
- Balance disturbance
- Difficulty with fine motor skills (e.g., buttoning clothing, writing)

**Autonomic Symptoms**
- Constipation
- Urinary retention
- Sexual dysfunction
- Blood pressure alterations

**Figure 1. Characteristics of Chemotherapy-Induced Peripheral Neuropathy**
Peripheral Neuropathy - CIPN

- **Functional Assessment**
  - Listen for key words
    * Tripping
    * Falling
    * Catching my feet
    * “Walking on balloons”
  - Reports of:
    * Ambulation deficits
    * Dropping items
    * Trouble with FM tasks
      * Writing, buttoning, etc
    * ADL deficits

- **Treatment**
  - **No rehab will cure this**
  - PT/OT to Focus on
    * Exercise
    * Task modification
    * Compensation strategies
    * Safety/ skin care
    * Quality of Life
    * Gait training
    * Assistive devices or equipment
    * Home modification
    * Desensitization
    * Pain control/ Biofeedback
    * Manual therapy
Lymphedema
6 THINGS YOU MAY NOT KNOW ABOUT LYMPHEDEMA

1. Lymhedeema is chronic swelling caused by a build-up of fluid that occurs when the lymphatic system is either faulty or damaged.

2. An estimated 3-5 million Americans suffer from lymphedema — including many that are undiagnosed or undertreated. That is more than ALS, Cystic Fibrosis, Multiple Sclerosis, Muscular Dystrophy, and Parkinson’s Disease combined.

3. Most physicians in the United States are taught about the lymphatic system for 1 hour or less during their 4 years of medical school training.

4. There is no known cure for lymphedema, but it can be effectively treated. Compression therapy is the most critical component of treatment. Without it, patients are at increased risk for complications and disability.

5. Medicare, and many private insurance policies do NOT cover compression garments, wraps, or bandages — the supplies needed for compression therapy.

6. The Lymphedema Treatment Act is a bill, currently in Congress, that aims to improve insurance coverage for compression supplies, allowing lymphedema patients to maintain a healthy and productive life.

Visit our website to learn more about lymphedema and how to support this bill. LymphedemaTreatmentAct.org
Lymphedema

- Definition:
  - NCCN defines Lymphedema: “a clinical condition that arises when either a loss of function or structural damage to the lymphatic circulation occurs. The term "edema" means swelling. Hence, lymphedema literally means swelling due to the disruption of the flow of lymph fluid.”
  - Chronic and progressive diagnoses
- No cure, but there is management
- Can occur when ANY lymph nodes are removed
- Incidence:
  - 80% of patients have onset within 2 years of surgical insult, and 89% within 3 years
  - Not uncommon years after treatment
  - Upper extremity lymphedema occurs most commonly following breast cancer treatment
  - Lower extremity edema most often occurs with gynecologic, prostate, and melanoma cancers
Lymphedema

• Causes
  ▫ Axillary lymph node dissection (ALND) carries an approximate rate of lymphedema of 18-24%
  ▫ Radiation therapy increases this risk to 48% after ALND
  ▫ Sentinel node dissection (SLND) carries a rate of 0.1 to 5% (without radiation)
  ▫ Leg edema estimated to be about 40% rate after complete PLND

• Risk Factors
  ▫ Obesity (can increase risk 3.6 times in BMI>30)
  ▫ Local radiation
  ▫ Infection
  ▫ Paresis/paralysis
  ▫ Tumor obstruction
  ▫ Chemotherapy (may cause scarring)
Lymphedema

- **Symptoms:**
  - Visible swelling
  - Feeling of heaviness, aching in the limb numbness and tingling
  - Decreased ROM/strength
  - Clothing and/or jewelry fit too tightly
  - Difficulty with household or self-care tasks
  - Pulling into the axilla with movement (axillary web syndrome)
Lymphedema

- **Treatments:**
  - Early education
  - Early intervention
  - Manual lymphatic draining (MLD)
  - Multi-layer bandaging (MLB)
  - Skin care
  - Compression garments
  - Exercise
    - *A program encompassing all of above is lymphedema management - sometimes termed complete decongestive therapy (CDT)*

- All interventions should be completed by a therapist that has completed extensive training and has a specialized certification (Certified Lymphedema Therapist- CLT)
Lymphedema

- Treatment: Manual Lymph drainage (MLD)
  - **Goal:** Decongest swelling
  - Redirects the lymph flow around blocked areas into more centrally located healthy lymph vessels, which drain into the venous system
  - The healthy lymph nodes and lymph vessels, generally located adjacent to the area with insufficient lymphatic drainage, are manipulated with MLD.
  - **Benefits:**
    - Increase protein reabsorption
    - Mobilize lymph fluid
    - Increase venous return
    - Stimulate smooth muscle contraction in lymph vessels
    - Accelerate drainage of nociceptive substances in tissue
Lymphedema

- **Treatments**: Compression
  - Always a risk of re-accumulation after decongestion
  - We are recycling fluid into/out of our limbs every 30 to 45 minutes
  - Sufficient compression is required to hold back the swelling...
- **During treatment/maintenance:**
  - Multi-layer bandages
  - Garments
  - Combination of both
  - Bandage alternative
  - Compression pump use
# Lymphedema

<table>
<thead>
<tr>
<th>Sample</th>
<th>Method</th>
<th>Results</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pts with lymphedema</td>
<td>Weight training 2x/week 6 months</td>
<td>No ↑</td>
<td>Ahmed (2006)</td>
</tr>
<tr>
<td>141 pts with stable UE lymphedema</td>
<td>Weight training Wearing compression sleeve during exercise</td>
<td>No ↑ Incidence of swelling same as control group</td>
<td>Schmitz (2009)</td>
</tr>
<tr>
<td>4 articles reviewed</td>
<td>Lit Review of Articles</td>
<td>No difference found in incidence of lymphedema with/without exercise</td>
<td>Cavanaugh (2011)</td>
</tr>
</tbody>
</table>
Incontinence
Incontinence

• **Cause:**
  - Occurs in many pts following:
    - prostate surgery
    - GYN surgery
    - bladder surgery
    - other abdominal surgeries

• **Treatment:**
  - pelvic floor re-education,
  - strengthening,
  - biofeedback
# Incontinence Research

<table>
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<tr>
<th>Sample</th>
<th>Method</th>
<th>Results</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 pts Post op</td>
<td>All pts taught exercises post op Group 1 – follow up with PT Group 2 – no follow up with PT</td>
<td>3 month 46% / 43% 6 month 79% / 58% 1 year 92% / 72%</td>
<td>Overgard (2008)</td>
</tr>
<tr>
<td>208 pts Post op prostatectomy</td>
<td>Group 1: Behavioral therapy Group 2: Beh + Biofeedback Group 3: No intervention</td>
<td>55% ↓ in incontinence episodes with behavioral therapy 51% ↓ in episodes with behav + biofeedback</td>
<td>Goode (2011)</td>
</tr>
</tbody>
</table>
Osteoporosis
Osteoporosis

- One of the long term complications of successful cancer treatment
- Cause:
  - Steroids
  - XRT
  - Decreased activity
  - Gonadal failure
- Is common in prostate cancer, but rarely addressed. Focus is much larger in breast cancer
Osteoporosis

• **Treatment:**
  ▫ **Weight bearing activities**

• **Prevention:**
  ▫ **Daily weight bearing activities**
  ▫ **Light-moderate resistance exercises as tolerated**
  ▫ **Along with dietary support, medications**
Osteoporosis research

<table>
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<th>Methods</th>
<th>Results</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast ca pts in menopause</td>
<td>16-24 weeks of walking activity</td>
<td>Maintenance of bone mass and weight</td>
<td>Knobf (2008)</td>
</tr>
<tr>
<td></td>
<td>3x/week for 45 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prostate ca pts on ADT treatment</td>
<td>Lit Review – 12 articles</td>
<td>Resistance ↓ fractures</td>
<td>Bolam (2012)</td>
</tr>
</tbody>
</table>
Cognition
Cognition

• Causes
  ▫ CNS tumor
  ▫ Cancer treatments
    • XRT (especially whole brain)
    • Chemotherapy
    • Endocrine therapy

• Screening/Assessment
  ▫ Mainly self reported
  ▫ No brief screening tools shown to be effective

• Differential Diagnoses (Can mimic cognitive deficits)
  ▫ Depression
  ▫ Severe or chronic pain
  ▫ Lack of sleep
  ▫ Fatigue
  ▫ Medication
Cognition

• Areas affected:
  ▫ Executive function
    • **Inhibition** - The ability to stop one's own behavior at the appropriate time, including stopping actions and thoughts.
    • **Shift** - The ability to move freely from one situation to another and to think flexibly
    • **Emotional Control** - The ability to modulate emotional responses by bringing rational thought to bear on feelings. (The example here is Robin's anger when confronted with her own impulsive behavior in committing the family before checking out the dates: "Why are you all being so negative?")
    • **Initiation** - The ability to begin a task or activity and to independently generate ideas, responses, or problem-solving strategies.
    • **Working memory** - The capacity to hold information in mind for the purpose of completing a task.
    • **Planning/Organization** - The ability to manage current and future-oriented task demands
    • **Organization of Materials** - The ability to impose order on work, play, and storage spaces
    • **Self-Monitoring** - The ability to monitor one's own performance and to measure it against some standard of what is needed or expected
Cognition

- Assessment
  - MoCA
Cognition

**Treatment**: OT or Speech can assess and treat Cognitive deficits

![Diagram showing strategies and skills for Cognitive Rehabilitation](image_url)
Summary

• Rehab services plays a vital role in the survivorship team.
• Be aware of patients’ signs and symptoms and ask questions to assess needs
  ▫ Advocate for referrals to outpatient PT, OT or Speech therapy for evaluation and treatment
  ▫ *Lymphedema needs to be addressed ASAP-Order for:
    • “OT/PT Lymphedema Evaluation and Treat”
References

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