CANCER REHABILITATION 101: WHEN SURVIVAL IS NOT ENOUGH

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OBJECTIVES

- Define Physiatric Role in Patient Care
- Increase Awareness of Unique Functional Issues facing Cancer Survivors
- Understand the Comprehensive Nature of Cancer Rehabilitation throughout Continuum of Care
WHAT IS A PHYSIATRIST?

A physiatrist is a Physician specialist in Physical Medicine and Rehabilitation (PM&R), responsible for patient functional health.

PM&R is a medical specialty emphasizing the prevention, diagnosis, treatment, and restoration of functional loss produce by medical illness causing temporary or permanent functional impairment.

Rehabilitation TEAM addresses the function of the whole patient, as compared with a focus on an organ system or systems.
CONDITIONS TREATED
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- Amputation
- Spinal cord injury
- Traumatic brain injury
- Stroke
- Musculoskeletal injuries
- Pain syndromes
- Cardiac disorders
- Neurologic disorders

Among many others… including Cancer
What is cancer rehabilitation?

- Any evaluation/intervention assisting in restoration of maximum function and **ABILITY**…

- In **ANY** patient with cancer…

- At **ANY** point in the disease continuum
WHERE DOES REHABILITATION MEDICINE FIT?

CANCER REHABILITATION CONTINUUM

ACUTE CARE  CANCER TREATMENT  RETURN TO DAILY LIFE
CANCER REHABILITATION: AN INTEGRATED TEAM APPROACH

This is Rehabilitation at its BEST

Primary Care Team
- Rehabilitation Nurse
- Occupational Therapist
- Speech Language Pathologist
- Dietitian

Oncology Team (Medical, Surgical, Radiation)
- Rehabilitation Physician
- Physical Therapist
- Psychologist
- Pharmacist
- Social Worker

Exer. Physiologist

Chaplain

Pharmacology Team (Medical, Surgical, Radiation)
WHERE TO START?
### Figure 1. Estimated Numbers of US Cancer Survivors by Site

**As of January 1, 2012**

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>Breast</td>
</tr>
<tr>
<td>2,778,630 (43%)</td>
<td>2,971,610 (41%)</td>
</tr>
<tr>
<td>Colon &amp; rectum</td>
<td>Uterine corpus</td>
</tr>
<tr>
<td>595,210 (9%)</td>
<td>606,910 (8%)</td>
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<tr>
<td>Melanoma</td>
<td>Colon &amp; rectum</td>
</tr>
<tr>
<td>437,180 (7%)</td>
<td>618,533 (8%)</td>
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<tr>
<td>Non-Hodgkin lymphoma</td>
<td>Melanoma</td>
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<tr>
<td>279,500 (4%)</td>
<td>496,210 (7%)</td>
</tr>
<tr>
<td>Testis</td>
<td>Thyroid</td>
</tr>
<tr>
<td>230,910 (4%)</td>
<td>185,990 (3%)</td>
</tr>
<tr>
<td>Kidney &amp; renal pelvis</td>
<td>Uterine cervix</td>
</tr>
<tr>
<td>213,000 (3%)</td>
<td>245,020 (3%)</td>
</tr>
<tr>
<td>Lung &amp; bronchus</td>
<td>Lung &amp; bronchus</td>
</tr>
<tr>
<td>189,080 (3%)</td>
<td>223,150 (3%)</td>
</tr>
<tr>
<td>Oral cavity &amp; pharynx</td>
<td>Ovary</td>
</tr>
<tr>
<td>185,240 (3%)</td>
<td>192,750 (3%)</td>
</tr>
<tr>
<td>Leukemia</td>
<td>Urinary bladder</td>
</tr>
<tr>
<td>167,740 (3%)</td>
<td>148,210 (2%)</td>
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<tr>
<td><strong>All sites</strong></td>
<td><strong>All sites</strong></td>
</tr>
<tr>
<td>6,442,280</td>
<td>7,241,570</td>
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**As of January 1, 2022**

<table>
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<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>Breast</td>
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<tr>
<td>3,922,600 (45%)</td>
<td>751,590 (9%)</td>
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<tr>
<td>Colon &amp; rectum</td>
<td>Melanoma</td>
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<tr>
<td>735,720 (8%)</td>
<td>661,880 (8%)</td>
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<tr>
<td>Uterine bladder</td>
<td>Urinary bladder</td>
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<tr>
<td>548,870 (6%)</td>
<td>548,870 (6%)</td>
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<tr>
<td>Thyroid</td>
<td>Non-Hodgkin lymphoma</td>
</tr>
<tr>
<td>371,980 (7%)</td>
<td>341,830 (4%)</td>
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<tr>
<td>Kidney &amp; renal pelvis</td>
<td>Testis</td>
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<tr>
<td>300,800 (3%)</td>
<td>295,590 (3%)</td>
</tr>
<tr>
<td>Lung &amp; bronchus</td>
<td>Oral cavity &amp; pharynx</td>
</tr>
<tr>
<td>223,330 (3%)</td>
<td>232,330 (3%)</td>
</tr>
<tr>
<td>Lung &amp; bronchus</td>
<td>Lung &amp; bronchus</td>
</tr>
<tr>
<td>231,380 (3%)</td>
<td>231,380 (3%)</td>
</tr>
<tr>
<td>Oral cavity &amp; pharynx</td>
<td>Leukemia</td>
</tr>
<tr>
<td>220,010 (3%)</td>
<td>220,010 (3%)</td>
</tr>
<tr>
<td>Kidney &amp; renal pelvis</td>
<td>Ovary</td>
</tr>
<tr>
<td>208,250 (2%)</td>
<td>229,020 (2%)</td>
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<tr>
<td><strong>All sites</strong></td>
<td><strong>All sites</strong></td>
</tr>
<tr>
<td>8,796,830</td>
<td>9,184,550</td>
</tr>
</tbody>
</table>

Source: Data Modeling Branch, Division of Cancer Control and Population Sciences, National Cancer Institute.

American Cancer Society, Intramural Research, 2012

**Almost 13.7 million**

**Over 17.9 million**
PREVALENCE OF CANCER SURVIVORS

Institute of Medicine and National Research Council of the National Academies, 2013
WHAT IS CANCER SURVIVORSHIP?

According to the National Cancer Institute/National Coalition for Cancer Survivorship:

- An individual is considered a cancer survivor from the **TIME OF CANCER DIAGNOSIS, THROUGH THE BALANCE OF HIS OR HER LIFE.**

Recently “balance of life” is increasing

- Role of providers not yet clearly defined
Cancer survivorship issues

- Short-term effects

- Long-term effects (persistent)
  - Begin during treatment and continue

- Late effects
  - Manifest long after treatment
  - Unrecognized toxicities
CANCER SURVIVORSHIP: REHABILITATION CARE

- Survivorship Issues/Experiences Issues are Unique
  - Disease-specific
    - Cancer type
    - Organ involvement (local/remote)
  - Treatment-specific
    - Surgery
    - Chemotherapy, Hormonal therapy
    - Radiation
  - Individual-specific
    - PRE-CANCER MEDICAL/FUNCTIONAL STATUS
    - PRE-CANCER PSYCH/SOCIAL STATUS
**Quality Cancer Survivorship Model of Care:**

- **Prevention**
  - Considerations at diagnosis/treatment
- **Surveillance**
  - Monitor closely in follow-up
- **Intervention**
  - If new issues discovered
- **Coordination of Services**
  - Assure cancer-related and general health needs met

Institute of Medicine and National Research Council of the National Academies, 2006
Cancer care delivery system is in crisis
Not as patient centered, accessible, coordinated, or evidence based as it could be

Goals:

1. Provide clinical and cost information to patients
2. End-of-life care consistent with patients’ values
3. Coordinated, team-based cancer care
4. Core competencies for the workforce
5. Expand breadth of cancer research data
6. Expand depth of cancer research data
7. Develop a learning health care IT system for cancer
8. A national quality reporting program for cancer care
9. Reduce disparities in access to cancer care
10. Improve the affordability of cancer care
1978 Lehman et al (Seattle)
• Multiple needs identified (psychological, functional) - key rehab role for intervention

2003 Movsas et al (UMDNJ)
• 87% of inpatient oncology unit with motor/functional needs (FIM)
• 18% received request for physiatric consultation

2008 Cheville et al (Mayo)
• Evaluated 163 outpatients with metastatic breast cancer
• 92% of patients had at least 1 physical impairment with total of 530 identified impairments - Only 30% received treatment

2009 Cheville et al (Mayo)
• 244 outpatients identified functional need
• EMR Oncology review documented minimal reference to function

CANCER REHABILITATION NEED ASSESSMENT: OUTPATIENT IDENTIFIED NEED
Cancer Rehabilitation Needs Assessment: Outpatient Caregiver Documented Need
CANCER PATIENT IDENTIFIED FUNCTIONAL ISSUES

- Pain
- Weakness/Deconditioning
- Mobility Loss
- ADL’s
- Cognition
- Communication

- Swallowing/Nutrition
- Bowel/Bladder/Sexual dysfunction
- Skin integrity/breakdown
- Social Support/Depression
- Vocational/Economic concerns
TREATMENT RELATED MEDICAL ISSUES

- Weight Change
- Arthralgia/Myalgia
- Headache
- Encephalopathy
- Cognitive Dysfunction
- Cerebral Edema
- Myelopathy
- Neuropathy
- Cytopenia
- Thrombosis
- Endocrinopathy

- Cardiac dysfunction
  - Nausea/Vomiting
  - Mucositis
  - Anorexia

- Pulmonary dysfunction
  - Depression
  - Hypomania

- Fatigue
  - Agitation
  - Insomnia/Sleep disturbances

- Osteoporosis

- Pain
- Infertility
  - Myopathy
  - Edema
  - Lymphedema
  - Tremors
  - Dysarthria/Dysphagia
  - Ataxia
  - Psychological Distress
  - Ototoxicity/Vertigo
- Retrospective review of 159 patients admitted over 2 years
- Patients with cancer of all types, even those with metastatic disease, made significant improvement in functional status as measured by the FIM score

Multiple studies (Geler-Kulcu et al. 2009, Greenberg et al. 2006, Huang et al. 1998, Huang et al. 2000, O'Dell et al. 1998) found brain tumor patients made gains comparable to stroke and TBI patients
- Further studies suggest that etiology of brain injury is not significant factor of rehabilitation efficiency (Mukand et al. 2001, Huang et al. 2005, Fu et al. 2010)
HOME BASED PROGRAM

- Prospective randomized 8 week Home based exercise program for 66 adults with Stage IV Lung and Colorectal Cancers
  - Single Physiotherapy Visit/Instruction in incremental walking and home-based strength training for 4 day/week program
  - Bimonthly phone calls increased step count and training.

- Primary Outcome: Mobility (Ambulatory Post Acute Care mobility short form)
  - Secondary outcomes: Pain, Sleep quality, ADL performance

- Intervention group: Improved mobility (P=0.01), Fatigue (P=0.02), and Sleep quality (P=0.05)

SPECIFIC REHABILITATION RELATED ISSUES
TREATMENT RELATED ISSUES

Surgery

- Precautions/Activity Modifications
- Edema/Lymphedema
- Sensory disturbances
- Wound healing
- Scar tissue formation/Limitation of ROM
- Altered body image
- Infection
Chemotherapy

• See prior slides
• Chemotherapy in combination radiation increases risks for complication and lower doses needed than if each given in isolation
  • Also increased risk with multiple chemotherapeutic agents

• Not only peripheral neuropathy
  • Can effect functional status in numerous ways
TREATMENT RELATED ISSUES

Radiation
- Fatigue
- Pain
- Damage to skin/Dermatitis
- Contractures
- Muscle atrophy/Myopathy
- Lymphedema
- Site specific effects….  
  - Pulmonary – Fibrosis, Pneumonitis
  - Cardiac – Cardiomyopathy
  - GU/GYN – Infertility, Menopause
  - Neurologic – Neuropathy, Plexopathy
  - Bone Health - Osteoporosis
CANCER RELATED FATIGUE (CRF)

Definition: Persistent, subjective sense of physical, emotional, and/or cognitive tiredness or exhaustion related to cancer or cancer related treatment - **Not relieved by rest**

- Increased need to rest
- Generalized weakness
- Limb heaviness
- Diminished concentration or attention
- Decreased motivation or interest to engage in usual activities
  - Insomnia or hypersomnia, Experience of sleep as unrefreshing or nonrestorative
  - Marked emotional reactivity (e.g., sadness, frustration, or irritability) to feeling fatigued
  - Difficulty completing daily tasks attributed to feeling fatigued
  - Perceived problems with short-term memory
CRF – CONTRIBUTING FACTORS

- Tumor effects
- Chemotherapy
  - Direct - Cytoxic effects
  - Indirect - Premature menopause, Psych/Cognitive effects, Thyroid dysfunction, Heart Failure
- Hormonal therapy
- Radiation (Regardless of site)
- Anemia
- Sleep difficulties
- Poor nutrition
- Depression
- Immobility
- Pain
CRF – TREATMENT

- 32 Cancer patients with Mild to Severe Fatigue during and after chemotherapy\(^1\)
  - 3 weeks of aerobic and resistance training program
  - 25% Reduction in Global Fatigue

- Cognitive Behavioral Therapy, Support groups, Counseling

- Energy Conserving Techniques

- Medications (Methylphenidate, Modafinil, Steroids, Antidepressants)

- Sleep hygiene

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OTHER TREATABLE REHABILITATION ISSUES

- Peripheral Neuropathy and other Nerve related issues
- Shoulder/Scapular Dysfunction
- Bone Disease – Osteoporosis, Metastatic Bone Disease
- Pain
- Cognitive Dysfunction
- Depression/Mood Disorders
DECONDITIONING

- Cumulative Multifactorial Phenomenon
- Results in Functional decline due to changes in multiple body systems
DECONDITIONING

- Lose 5-10% Muscle Mass per week

- Complete Immobility: Lose 1-3% of strength/day (1 week: Lose as much as 20-30%)

- After 3 weeks of bed rest, Resting HR increase to 10-12/min

- One contraction a day at 50% of maximal strength is enough to prevent this decrease

- Sensory Deprivation /Social Isolation/Depression

- Decreased Pain Tolerance
EXERCISE INTERVENTIONS

_known to benefit multiple aspects in all individuals
  - Cardiovascular
  - Pulmonary
  - Endocrine
  - Neurologic
  - Well-Being/Psychologic
  - Quality of Life

What does this mean to the Cancer patient?
American Cancer Society

- In order to see protective effect:
  - at least 150 minutes of moderate-intensity activity weekly
  - or
  - or 75 minutes of vigorous-intensity activity weekly
CARDIOPULMONARY FITNESS

• Measured by peak oxygen consumption
  \[ \text{VO}_{2\text{peak}} = \text{mL kg}^{-1} \text{min}^{-1}, \quad 3.5 \text{ mL kg}^{-1} \text{ min}^{-1} = 1 \text{ Metabolic Equivalent/MET} \]

• Known key predictor for mortality in all populations
• Previous research ‡ 12% improvement in survival for men and a reduction of death by 17% in women for every 1 MET increase in aerobic capacity \(^1,^2\)

• Breast cancer population ‡ VO\(_{2\text{peak}}\) is 21% lower than age-matched healthy sedentary women.\(^3\)

Breast Cancer

- 20 patients with stage IIB – IIIC operable breast cancer
  Doxorubicin plus cyclophosphamide (AC) chemotherapy or AC chemotherapy + Aerobic training for 12 weeks.

  Aerobic intervention – 3 supervised aerobic cycle ergometry sessions per week on non-consecutive days at 60% – 100% of exercise capacity (VO2peak)

Results
- No significant differences for adverse effects (clinician-documented events, hematological parameters)
- AC Group: VO2peak decreased by 8.6%
- AC+ Aerobic Group: VO2peak increased by 13.3% (between group difference, p 0.001)

Comprehensive review found a consistent positive association between physical activity and improved Quality of Life, mood, and fatigue during treatment for breast cancer, prostate cancer and hematological malignancies¹

Stem cell transplant²
- Patients receiving high dose chemo followed by autologous peripheral blood stem cell transplantation
- 33 in training group, 37 in control group
- Control group has 27% greater decrement in treadmill test
- Duration of neutropenia, thrombocytopenia, length of hospitalization, severity of diarrhea, and pain were reduced in the training group


**Efficacy of Exercise**

Colorectal Cancer \(^1,^2\)

- **>8.75 MET-hours per week (150 minutes of walking)** †
  - Lower *all-cause mortality* (v. <3.5 MET-hours per week)
- **6+ hours per day leisure time sitting** ‡
  - Higher *all-cause mortality* (v. < 3 hours per day)
- Greater BMI (Body Mass Index) ‡
  - Significantly higher risk of CTNNB1-negative cancer (but not CTNNB1-positive cancer risk)
- Physical *activity level associated with lower risk of CTNNB1-negative cancer* (but not CTNNB1-positive cancer risk)

(MET = Metabolic Equivalent of Task ‡ 1 MET = Energy used by Avg person at Rest)

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EFFICACY OF EXERCISE

β Nurses’ Health Study – Self Report for Breast Cancer Patients

• Regular physical activity after diagnosis ‡ Prolonged overall survival and disease-free interval
• Greatest benefit noted in those who performed 9 to 14.9 MET-hours per week of physical activity (walking 3 to 5 hours weekly)

β Metastatic lung cancer

• Functional capacity was independent predictor of overall survival
• >9 MET-hours per week ‡ Prolonged survival (26 months) v. <9 MET-hours per week (13 months)

β Recurrent malignant glioma

• >9 MET-hours per week ‡ associated with median survival of 22 months
• <9 MET-hours per week ‡ associated with median survival of 13 months

(MET = Metabolic Equivalent of Task ‡ 1 MET = Energy used by Avg person at Rest)

• Physical activity/exercise programs during treatment can reduce fatigue, improve physical performance, promote functional capacity, improve mood, decrease distress, decrease effects of immobility
• Exercise participation after treatment can improve self-esteem, physical functioning, fatigue, and global quality of life
CANCER REHABILITATION TAKE HOME MESSAGES

- Minimize effects of immobility
- Assist with effective pain management
- Develop a therapeutic exercise program
- Restore flexibility, strength, and endurance
- Overcome fatigue
- Enhance memory and concentration
- Address healthy lifestyle change
- Reintegrate into family, community, and daily life
- Develop home programs for patient AND family
For each patient…
There is no “right” plan;
There is a “best” plan!
THANK YOU!!!

QUESTIONS?