



# Cancer Comorbidities and exercise counter measures



## Cancer Related Fatigue (CRF)

- > "a distressing, persistent, subjective sense of tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning."
- > "Fatigue is by far the most common – and for many the most distressing symptom . . ."
- › National Comprehensive Cancer Network (NCCN)
- > is experienced by 70-100% of cancer patients while receiving chemotherapy



## General: Exercise & CRF

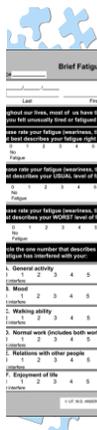
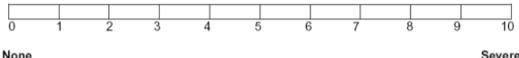
> "Exercise can be regarded as beneficial for individuals with cancer-related fatigue during and post cancer therapy. Further research is required to determine the optimal type, intensity and timing of an exercise intervention."

- > Cramp & Daniel J. Cochrane Database of Systematic Reviews 2008, Issue 2, Art. No.: CD006145
- > DOI: 10.1002/14651858.CD006145.pub2



## Assessment of CRF

Rate your fatigue on a scale of one to ten. 0 = no fatigue and 10 = worst fatigue ever.



## Assessment of CRF

## Brief Fatigue Inventory (BFI)



## Assessment of CRF

- > Time Required: Five minutes
- > Available in multiple languages
- > Scoring: A global fatigue score can be obtained by averaging all the items on the BFI:
- › Severe fatigue = a score of > 7
- › Moderate fatigue: 5-6
- › Mild fatigue: 1- 4

Mendoza TR, et al. C 85: 1185

## Survivor Fall Risk

- › Age
- › CIPN
- › Pain
- › Depression
- › Incontinence
- › Impaired cognition
- › Vestibular dysfunction
- › Impaired vision
- › Use of assistive devices
- › Impaired physical performance
- › Environmental issues
- › **Screen for fall risk in all setting**

## Fall Risk Assessment

- › Does person have history of falls?
- › TUG: older adult who takes > 12 seconds to complete is at high risk for a fall (CDC 2016)
- › 30 second sit<>stand: 60-64 y/o: < 14 times (male) < 12 times (female): is at a high risk for a fall (CDC 2016)

## Fall Risk Assessment

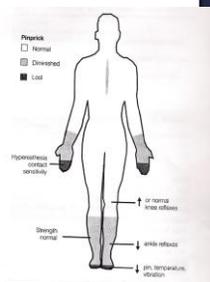
- › 4 stage balance test: full tandem stance < 10 sec fall- high risk for a fall (Hile 2012)
- › Mini Best Test: 14 items, scored from 0-2, max score is 28.
- › Clinical Test Sensory Interaction and Balance (CTSIB)

## Chemotherapy Induced Peripheral Neuropathy (CIPN)

- › A set of symptoms or problems caused by damage to peripheral nerves
- › In most cases is a sensory deficit
- › Symptoms
  - Pain
  - Numbness
  - Burning
  - Dropping things
  - Tingling ("pins and needles" feeling)
  - Heightened thermal sensitivity
  - Falling secondary to inner ear damage

## Clinical Presentation of CIPN

- › Decreased pin sensibility
- › Decreased vibration thresholds
- › Reduced nerve conduction velocity



## Treatment For CIPN

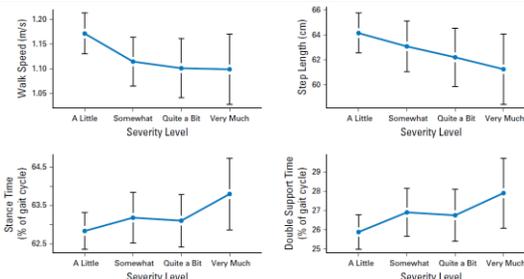
- › Treatment is supportive in nature: muscle strengthening, falls prevention, gait training, orthoses, desensitization, good nutrition, hydration, sleep, pain management, energy conservation for CRF, adaptive equipment (may refer to OT)
- › Nothing will help the nerve regenerate outside of surgery for a complete transection which is not the case in chemotherapy; provide optimal healing conditions during and after chemotherapy is discontinued

## Durability of CIPN

- › Forty-seven percent of the sample (female cancer survivors; n=512) reported that they experienced sensory loss in their lower extremities an average of 6 yrs after treatment.
- › These women reported worse function, greater disability, and more falls

› Winters-Stone et al. J Clin Oncol. 2017 Aug 10;35(23):2604-2612

## Impact of CIPN



Winters-Stone et al. J Clin Oncol. 2017 Aug 10;35(23):2604-2612

## Impact of CIPN

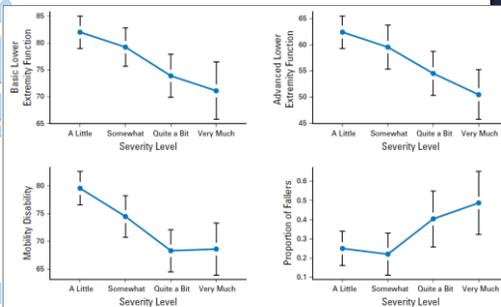


Fig 2. Effect of increasing chemotherapy-induced peripheral neuropathy symptom severity on patient-reported outcomes.  
Winters-Stone et al. J Clin Oncol. 2017 Aug 10;35(23):2604-2612

## CIPN and Exercise Training

- › Patients: RCT, Thirty patients (stage IV) undergoing outpatient palliative treatment
- › Intervention: an eight-week supervised exercise program, including endurance, resistance and balance training (2x/week for 60 min)
- › Results: Neuropathic symptoms remained stable in the treated group over time, while CIPN significantly worsened in the control group

› Zimmer P et al. Support Care Cancer. 2018 Feb;26(2):411-418

## CIPN and Exercise Training

- › Similar findings have been reported by
  - Kleckner IR et al. Support Care Cancer. 2018 Apr;26(4):1019-1028
  - Duregon F et al. Crit Rev Oncol Hematol. 2018 Jan;121:90-100.
- › Systematic review; 5 manuscripts were reviewed
- › "exercise for cancer patients undergoing chemotherapy with CIPN symptoms should be recommended since these interventions appeared as feasible and have been demonstrated as useful tools to counteract some of the limitations due to chemotherapy"

## CIPN and Assessment

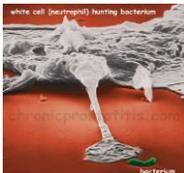
- Modified Total Neuropathy Score
  - › Assess sensory symptoms (paresthesias, numbness, neuropathic, myalgias or cramps)
  - › Assess motor symptoms (hand dexterity, gait, muscle strength)
- › DTR's (UE and LE)
- › Biothesiometer (measures simply and accurately the threshold of appreciation of vibration in human subjects)

– Wampler et al. Supportive Onc. 2006;4:w11



## Neutrophils

- › Most abundant WBC
- › First on the scene as line of defense
- › Perform phagocytic operations that defend against bacteria and fungi



## Neutropenia

- › Normal: adult male/female: 4500-11,000 cells/mm<sup>3</sup>
- › Absolute Neutrophil Count (ANC): < 500
- › Neutropenia/Neutropenic Fever
  - Infection is the leading cause of morbidity and mortality in oncology population
  - Prior to use of prophylactic use of antibiotics, there was a 95% mortality rate for febrile neutropenia
  - Most episodes are associated with people receiving myelosuppressive chemotherapy

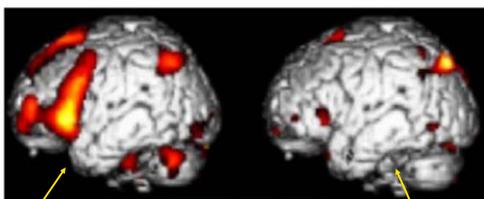
## Neutropenic Fever

- › Be alert to presence of possibility of neutropenia
- › Signs & symptoms of infection (redness, discharge, pain, inflammation, etc)
- › Use appropriate precautions when patient has neutropenia



## “Chemobrain”

- › Higher order mental functioning adversely affected
- › May happen, may not happen, may be transient
- › What is a clinically significant decline, a statistically significant decline?
- › May be dependent on subject age
- › Decline in cognitive functions: Concentration, reduced capacity to multitask, forgetfulness, may take longer to complete task



- › 5-10 yrs. Post chemotherapy for breast cancer
- › PET scan of blood flow during short term memory recall task

Age matched control

Silverman, DHS. Breast Cancer Res T

## Osteoporosis

- › WHO: occurs with T-score -2.5 or below
- › Associated with following cancer treatments:
  - surgical oophorectomy
  - chemotherapy-induced ovarian failure
  - Cyclophosphamides, platinum agents, anthracyclines, taxanes
  - androgen deprivation therapy
  - aromatase inhibitors
  - glucocorticoid therapy
  - bone irradiation

## Osteoporosis

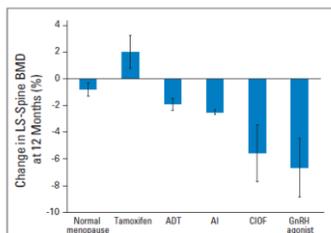
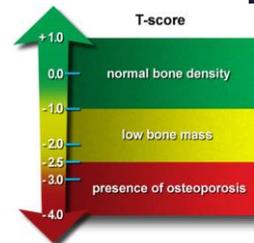


Fig 2. Change in bone mineral density (BMD) in first 12 months of therapy with various cancer treatments. BMD loss occurs with various cancer therapies at higher rates than those seen in normal aging in men and women.<sup>18</sup> Tamoxifen causes a small amount of bone loss in premenopausal women and preserves bone in postmenopausal women.<sup>14,18</sup> Androgen-deprivation therapy (ADT),<sup>19,20,21</sup> aromatase inhibitors (AI),<sup>22-24</sup> chemotherapy-induced ovarian failure (CIOF),<sup>17,26-30</sup> and gonadotropin-releasing hormone (GnRH) agonist therapy<sup>31,32</sup> all promote bone loss to varying degrees. LS, lumbar spine.

› Lustberg et al. JCO. 2012;30

## WHAT IS A T-SCORE?

› Reflects how your bone density compares to a younger adult of the same gender



## Osteoporosis Screening Tool

- Osteoporosis prescreening risk assessment or (OPBR)
- **selection cutpoint: score  $\geq 2$  points**
- Age  $\geq 65$  years 1 point
- Weight  $< 57$  kg 1 point
- History of minimal trauma fracture after age 45 1 point
- Early menopause (before the age of 45 years) 1 point
- Steroid use  $> 6$  months ( $> 5$  mg/day) 1 point

• Salaffi et al. Clin Rheumatol. 2005;24:208

## Osteoporosis



<http://www.shef.ac.uk/FRAX>

## Fracture Risk

- › Prostate cancer survivors
- › Involved training 8 major upper and lower body muscle groups
- › Supervised exercise sessions - 2 resistance exercise sessions/week for 12 weeks
  - Eight exercises that target the major muscle groups
  - Used controlled, smooth movements at a set cadence of 1–2 s for both eccentric and concentric phases
  - Started with a weight that could be moved 12X to fatigue; increased weight to 8X to fatigue and increased sets

## Fracture Risk

› **Monitored bone pain every session using the Functional Assessment of Cancer Therapy Bone Pain questionnaire**

- › Careful attention to RPE
- › No adverse events or skeletal complications occurred during the supervised exercise sessions.
- › Cormie P et al. Prostate Cancer and Prostatic Disease (2013) 16, 328–335

**Table 2 Modular multi-modal physical exercise program (M3EP) for prostate cancer with bone metastases**

Metastases site	Exercise mode					
	Resistance		Aerobic		Flexibility	
	Upper	Trunk	Lower	WB	NWB	Static
Pelvis	√	√	√**	√	√	√
Axial Skeleton (lumbar)	√		√	√	√	√***
Axial Skeleton (thoracic/ribs)	√*		√	√	√	√***
Proximal Femur	√	√	√**	√	√	√
All regions	√*		√**	√	√	√***

√ = Target exercise region; \* = exclusion of shoulder flexion/extension/abduction/adduction - inclusion of elbow flexion/extension; \*\* = exclusion of hip extension/flexion - inclusion of knee extension/flexion; WB weight bearing (e.g. walking); NWB non-weight bearing (e.g. cycling); \*\*\* = exclusion of spine/flexion/extension/rotation.

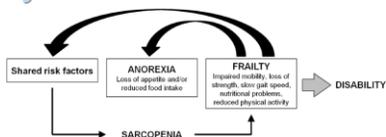
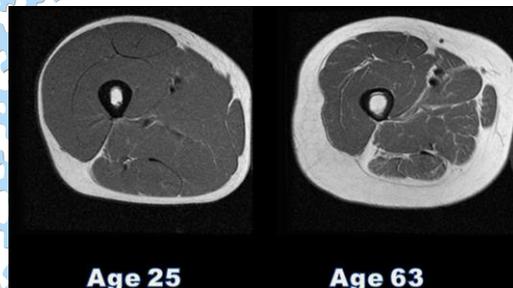
Galvao DA et al. BMC Cancer 2011, 11:517

### Thoughts for the Therapist

- › The correlation of osteoporosis with long term fracture risk is unclear.
- › Have bony mets been identified?
  - Correlation between size of mets and fracture risk remains poorly understood
- › Has osteoporosis been diagnosed?
- › Has patient received hormone therapy?
  - Glucocorticoids? Experienced premature menopause

### Aging associated decline in skeletal muscle: Sarcopenia

- › Sarcopenia
  - a. Age related loss of skeletal muscle mass
  - b. Reduced muscle mass (usually type II fibers)
    - a. Can be helped with strength training
  - c. Reduction in capillary blood supply
    - a. Can be helped with endurance training
  - d. Fewer satellite cells, increased myostatin production



### Radiation Side Effects

- › You can't see the damage:
  - XRT damages all tissue it penetrates and causes:
    - › fibrosis
    - › pain,
    - › cardiovascular effects
    - › bone (osteoporosis)
    - › renal exposure (HTN)
    - › radiation cystitis
    - › CNS/PNS problems
    - › sterility

## Surgical Trauma



## Surgical Trauma



## Chemotherapy: Side Effects

- Immune suppression, myelosuppression (anemia, neutropenia)
  - › Fatigue
  - › Pain
  - › Peripheral neuropathy
- N&V, Constipation, Diarrhea
  - › Cognitive impairments
- Mouth and Throat Changes (mucositis)
- Infertility
- Organ damage

## Chemotherapy: Long Term Side Effects

- › Myelosuppression
- › Pain
- › Fatigue
- › Infertility
- › Appetite changes
- › Diabetes
- › Memory Changes
- › Peripheral neuropathy

## Chemotherapy: Late Adverse Effects

- › Emerge years after completing chemotherapy
  - Cardiopulmonary changes
  - Impaired balance
  - Sexual and fertility changes in men & women
  - Premature frailty

With permission-M. Wampler-Kuhn, FT, DPTSc

## Oncology patients are complex

- Disease
  - Impairments can be related to primary or metastatic disease
- Surgery
  - Acute impairments
- Radiation
  - Acute impairments
  - Late or persistent impairments
- Chemotherapy
  - General impairments
  - Drug specific impairments

