EXERCISE GUIDELINES FOR THE CANCER SURVIVOR

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Exercise

Physical Activity

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EXERCISE BEHAVIOR OF CANCER SURVIVORS

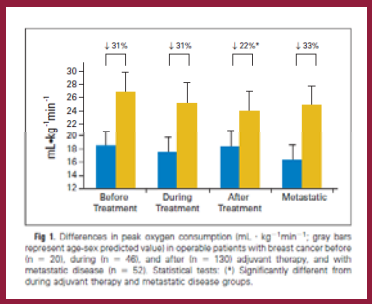

Fig 1. Differences in peak oxygen consumption (mL · kg⁻¹min⁻¹; gray bars represent age-sex predicted value) in operable patients with breast cancer before (n = 201), during (n = 46), and after (n = 130) adjuvant therapy, and with metastatic disease (n = 52). Statistical tests: (*) Significantly different from during adjuvant therapy and metastatic disease groups.

Jones, LW et al. JCO. 2012:30: 2530

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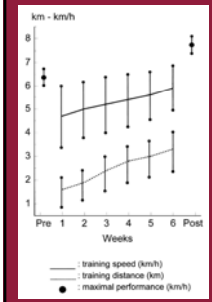
CAN THE CANCER SURVIVOR ADAPT TO EXERCISE TRAINING?



	Before	After	Significance
Training speed ($km \cdot h^{-1}$)	4.8 ± 1.5	5.9 ± 1.1	$P = 0.06$
Training distance (m)	1640 ± 724	3300 ± 953	$P < 0.05$
Maximal performance ($km \cdot h^{-1}$)	6.4 ± 0.4	7.5 ± 0.9	$P < 0.05$
Maximal performance (MET)	4.9 ± 0.3	5.5 ± 0.5	$P < 0.05$
Heart rate ($beats \cdot min^{-1}$) (*)	138 ± 21	113 ± 20	$P < 0.05$
Lactate concentration ($mmol \cdot L^{-1}$) (*)	2.6 ± 1.3	1.3 ± 0.5	$P < 0.05$

* by a submaximal workload of 5 km · h, corresponding to the usual walking speed.

Dimeo. Med Sci Sport Exerc. 1998;30:475.

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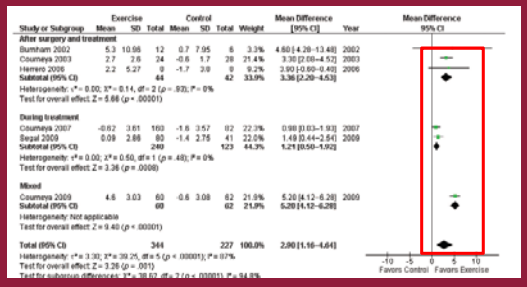
CAN THE CANCER SURVIVOR ADAPT TO EXERCISE TRAINING?



Jones et al. The Oncologist. 2011;16:112

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IS EXERCISE TRAINING SAFE FOR THE CANCER SURVIVOR?

- Maximal Exercise Testing:
  - 85 Pts. 49 NSCL and 36 met. breast cancer
  - Underwent maximum CPET
  - 2 adverse events reported: Hip pain 2^0 to undiagnosed metastatic disease, RBBB that resolved

– Jones LW et al, Lung Cancer 2007; 55: 225—232

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IS EXERCISE TRAINING SAFE FOR THE CANCER SURVIVOR?

- Resistance Training Study:
  - Breast cancer survivors, n = 85
  - 6 months of resistance exercise training
  - 7 reports of injuries
    - Back- 4; 1 each-shin, wrist, other
    - 1100 hrs. of exercise
    - No injuries prevented continuing exercise program
      - Schmitz et al. Cancer Epidemiol Biomarkers Prev 2005;14:1672-80.

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BENEFITS OF EXERCISE TRAINING

IMPROVEMENTS IN

- Muscle mass, strength, power
- Physical function
- Physical activity levels
- Range of motion
- Immune function
- Chemotherapy completion rates
- Body image, self esteem and mood

REDUCTIONS IN

- Number of symptoms and side effects
- Duration of hospitalization

side-effects reported

- **Psychological and emotional stress**
- **Depression and anxiety**

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SUMMARY

- Cancer survivors tend not to exercise
  - Results in functional compromise
- Cancer survivors can safely participate in exercise training at all points along the cancer trajectory
- Cancer survivors can adapt to exercise training at all points along the cancer continuum
  - Improved functional capacity
  - Improved psychosocial status
  - Improved physiological status

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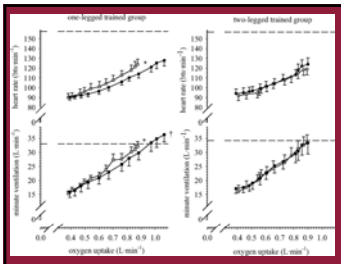

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EXERCISE GUIDELINES FOR CANCER SURVIVORS

American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention
Reducing the Risk of Cancer With Healthy Food Choices and Physical Activity

Comment
Pre-exercise screening and prescription guidelines for cancer patients

Position stand
Australian Association for Exercise and Sport Science position stand: Optimising cancer outcomes through exercise
Sandra C. Hayes[a,*], Rosalind R. Spence[b], Daniel A. Galvão[c], Robert U. Newton[c]

The BASES Expert Statement on Exercise and Cancer Survivorship
Anna Campbell [a], Clare Stevinson [b] & Helen Crank [c]

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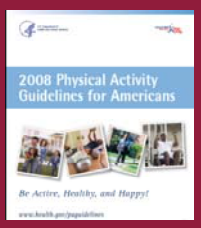
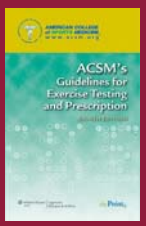
CLINICAL EXERCISE GUIDELINES





American College of Sports Medicine Roundtable on Exercise Guidelines for Cancer Survivors

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CLINICAL EXERCISE GUIDELINES: PA Guidelines for Americans

- "Avoid inactivity"
- 150 minutes/week of moderate intensity exercise or 75 min of vigorous intensity exercise
- 300 minutes/week for additional health benefits
- Muscle strengthening activities 2 or more days per week
  - HHS and ACSM Exercise guidelines for healthy adults

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CLINICAL EXERCISE GUIDELINES: PA Guidelines for Americans

- Specific guidelines for those with **chronic illness**
  - Should adhere, if possible, to the guidelines for healthy adults i.e. 150 min/wk
  - These individuals "should engage in regular physical activity according to their abilities and should avoid inactivity."
  - "…should consult their health-care providers to match their physical activity plan to their abilities and health status"
    - HHS. PA Guidelines for Americans

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CLINICAL EXERCISE GUIDELINES

- Help clinicians determine:
  - Is it safe for the patient to exercise?
  - Is the patient exercising safely and how do I know this to be the case?
  - How do I write an exercise prescription?
    - How do we optimally integrate frequency, intensity, duration, mode and progression into an effective treatment program

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CLINICAL EXERCISE GUIDELINES: ACSM Guidelines 8th ed. 2010

- Offers no specific guidelines for patients with cancer
- Refer the reader to those proposed by Neely et al. Curr Canc Ther Rev 2006;2:351)
- Acknowledge that the guidelines are conservative
- Call for a thorough screening for cancer comorbidities and defines exercise contraindications

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CLINICAL EXERCISE GUIDELINES: ACSM Guidelines 8th ed. 2010

- Advocated symptom limited or maximal exercise testing
- Limitations imposed by cancer related fatigue
- Bone Mets: Avoid high impact and contact activities
- Myelosuppressed patients should avoid public exercise facilities
- Symptoms may require frequent modification of exercise prescription

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CLINICAL EXERCISE GUIDELINES: McNeely et al. 2006

- Medical screening necessary
- Formal exercise testing should be conducted
- Exercise programs should be individualized
  - "…the status of, and response to exercise, of a cancer survivor may fluctuate on a daily basis."
    - McNeely et al. Curr Canc Ther Rev 2006;2:351

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CLINICAL EXERCISE GUIDELINES: McNeely et al. 2006

- Warm up, exercise phase (20-60 min), cool-down 3-5 days/wk
  - Aerobic training: walking, cycle ergometry
  - First reach target frequency (3-5 days/wk)
  - Next achieve target duration (>20 min/session)
  - Start slowly if patient is deconditioned
  - Progress intensity (40-60% of HRR)
  - **Increase duration before intensity**

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Table 3. Contraindications and Precautions to Exercise Testing and Training

	Contraindications to Exercise Testing and Training	Precautions Requiring Modification and/or Physician Approval
Factors related to cancer treatment	• No exercise on days of intravenous chemotherapy or within 24 hours of treatment • No exercise prior to blood draw • Severe tissue reaction to radiation therapy	• Caution if on treatments that affect lungs and/or heart: recommend medically supervised exercise testing and training • Mouth sores/ulcerations: avoid mouthpieces for maximal testing. Use face masks.
Hematologic (Laboratory values)	• Platelets < 50,000 • White blood cells < 3,000 • Hemoglobin < 10g/dl	• Platelets > 50,000 to 150,000: avoid tests that increase risk of bleeding • White blood cells >3,000 to 4,000: ensure proper sterilization of equipment • Hemoglobin > 10g/dl to 11.5/ 13.5 g/dL: caution with maximal tests
Musculoskeletal	• Bone, back or neck pain of recent origin • Unusual muscular weakness • Severe cachexia • Unusual / extreme fatigue • Poor functional status: avoid exercise testing if Karnofsky Performance Status score ≤ 60%	• Any pain or cramping: investigate • Osteopenia: avoid high impact exercise if risk of fracture • Steroid-induced myopathy: • Cachexia: multidisciplinary approach to exercise • Mild to moderate fatigue: closely monitor response to exercise
Systemic	• Acute infections • Febrile illness: fever > 100° F (38° Celsius) • General malaise	• Recent systemic illness or infection: avoid exercise until asymptomatic for > 48 hours

McNeely et al. Curr Canc Ther Rev 2006;2:351

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Gastrointestinal	• Severe nausea • Vomiting or diarrhea within previous 24 to 36 hours • Dehydration • Poor nutrition: inadequate fluid and/or food intake	• Compromised fluid and/or food intake: recommend multidisciplinary approach/ consultation with nutritionist
Cardiovascular	• Chest pain • Resting pulse > 100 b/min or < 50 b/min • Resting blood pressure > 145 mm Hg systolic and 95 mm Hg diastolic • Resting blood pressure < 85 mm Hg systolic • Irregular pulse • Swelling of ankles	• Caution if at risk of cardiac disease: recommend medically supervised exercise testing and training • If on blood pressure medication that controls heart rate, target HR may not be attainable; do not overexert • Lymphedema: wear compression garment on limb when exercising
Pulmonary	• Severe dyspnea • Cough, wheezing • Chest pain increased by deep breath	• Mild to moderate dyspnea: avoid maximal tests
Neurological	• Significant decline in cognitive status • Dizzyness/ lightheaded • Disorientation • Blurred vision • Ataxia	• Mild cognitive changes: ensure that patient is able to understand and follow instructions • Poor balance/ peripheral sensory neuropathy: use well supported positions for exercise

McNeely et al. Curr Canc Ther Rev 2006;2:351

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ABSOLUTE CONTRAINDICATIONS TO PARTICIPATING IN EXERCISE TRAINING

- Recent significant change in resting ECG
- Unstable angina
- Uncontrolled cardiac dysrhythmias causing symptoms or hemodynamic compromise
- Symptomatic aortic stenosis

– ACSM's Guidelines for Ex. Testing. 8th edition

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ABSOLUTE CONTRAINDICATIONS TO PARTICIPATING IN EXERCISE TRAINING

- Uncontrolled HF
- Acute PE or pulmonary infarction
- Acute myocarditis or pericarditis
- Acute systemic infection, accompanied by fever, body aches, or swollen lymph

- ACSM's Guidelines for Ex. Testing. 8th edition

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RELATIVE CONTRAINDICATIONS TO PARTICIPATING IN EXERCISE TRAINING
(clinical decision making)

- Electrolyte abnormalities
  - K^+ < 3.5 mmol/liter
- Severe arterial hypertension (at rest)
  - Systolic BP > 200 mmHg; Diastolic BP> 110 mmHg

ACSM's Guidelines for Ex. Testing. 8th edition

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RELATIVE CONTRAINDICATIONS TO PARTICIPATING IN EXERCISE TRAINING

(clinical decision making)

- Uncontrolled metabolic disease:
  - Diabetes,
  - Renal
  - Liver disease

ACSM's Guidelines for Ex. Testing. 8th edition

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EXERCISE SAFETY: WHEN TO STOP AN EXERCISE SESSION?

- Drop in systolic pressure > 10 mmHg from baseline; failure of HR to increase with increasing exertion
- Excessive rise in blood pressure: SP> 250 mmHg, DP > 115 mmHg
- Onset of angina or angina like symptoms

ACSM Guidelines, 8th edition

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EXERCISE SAFETY: WHEN TO STOP AN EXERCISE SESSION?

- Increasing nervous system symptoms (ataxia, dizziness, confusion, nausea)
- Signs of poor perfusion (cyanosis, pallor)
- SOB, excessive fatigue, wheezing, leg cramps

ACSM Guidelines, 8th edition

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Cancer Rehabilitation: Recommendations for Integrating Exercise Programming in the Clinical Practice Setting

Margaret L. McNeely[1], Carolyn Peddle[2], Matthew Parliament[2] and Kerry S. Courneya[3]

American College of Sports Medicine Roundtable on Exercise Guidelines for Cancer Survivors

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- Predicated on available evidence
- Developed against the backdrop of existing recommendations of ACSM, AHA, US Dept. of HHS
- "…provide a broad outline to health and
- fitness professionals interested in implementing physical activity programs for cancer survivors."
  - MSSE. 2010;42:1409

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- Pre-Participation screening
  - Not recommended
- Exercise Testing
  - Not recommended
- Criteria for suspending an exercise session and components of an exercise prescription
  - Same as those outlined in the ACSM exercise guidelines 8th edition
  - MSSE., 2010;42:1409

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- General safety recommendations:
  - Evaluate for peripheral neuropathies
  - Evaluate for fracture risk (hormone therapy/metastatic disease)
  - Carry out CV evaluation for those receiving specific chemotherapy regimes
  - If metastatic disease to bone is present do a fracture risk assessment; evaluate for osteoporosis

– MSSE. 2010;42:1409

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GENERAL SAFETY RECOMMENDATIONS Evaluate for peripheral neuropathies

- Sensory evaluation-both hands and feet
- Deep tendon reflexes
- Muscle strength

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GENERAL SAFETY RECOMMENDATIONS Evaluate for fracture risk

- Survivors on hormone therapy (prostate, breast) should be evaluated for fracture risk
- Lung, colorectal, esophogeal prostate cancers metastasize to the bone
- Multiple myeloma survivors should be assumed to be osteoporotic

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GENERAL SAFETY RECOMMENDATIONS
Evaluate for fracture risk

- Evaluate for fracture risk
  - World Health Organization Fracture Risk Assessment Tool (FRAX)
  - http://www.shef.ac.uk/FRAX/
  - Review radiologic studies
- No fracture risk level has been defined as indicating that exercise is unsafe
- Bone mets are NOT detected by X ray if < 30% of bone involved
- Clinical Judgment !!!!!!!!!!!!!!!

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GENERAL SAFETY RECOMMENDATIONS
Evaluate for fracture risk

- PT restrictions by cortical bone involvement (Coleman)
  - Less than 25% = submax isometrics, gentle aerobics, WBAT
  - 25 – 50% = gentle ROM w/o pressure into end range, PWB
  - > 50% = may need to defer exercise, maintain NWB

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GENERAL SAFETY RECOMMENDATIONS
Evaluate for fracture risk

- Osteoporosis prescreening risk assessment (OPERA)
  - Selection cutpoint: score ≥ 2
  - Age ‡ 65 years 1
  - Weight <57 kg 1
  - History of minimal trauma fracture after age 45 1
  - Early menopause (before the age of 45 years) 1
  - Steroid use > 6 months (>5 mg/day) 1

- Salaffi et al. Clin Rheumatol. 2005;24:203–211

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GENERAL SAFETY RECOMMENDATIONS CV Screening

- Vital signs
- History
- S & S
  - Dyspnea at rest
  - Chest pain at rest or during exercise
  - Hx. Dizzyness/syncope
  - Ankle swelling/ankle edema
  - Cyanosis
  - Finger clubbing

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- **Contraindications** to participation in an exercise program:
  - Same as those in the ACSM Exercise Guidelines
  - Anemia, extreme fatigue, known CV disease
  - Breast Cancer: Immediate arm/shoulder problems
  - Colon Cancer: Physician permission for ostomy patients
  - Gynecologic: Presence of abdominal & LE swelling
  - MSSE. 2010;42:1409

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- Disease specific safety recommendations:
  - Breast Cancer
    - Carry out arm/shoulder evaluation prior to undergoing exercise training
    - Monitor for change in arm and shoulder while in an exercise program
  - Prostate Cancer
    - Strength assessment prior to undergoing exercise training
    - Fracture risk

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- Disease specific safety recommendations:
  - HSCT
    - Avoid overtraining b/c of myelosuppression
  - Gynecologic
    - Special supervision if obese
  - Colon
    - Can patient perform stoma care?
    - Progress slowly

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SUMMARY

- Is it reasonably safe for a cancer survivor to participate in an exercise training program?
  - History
  - Understand implications of medical hx.
  - Lab values
  - Medical Clearance/preparticipation clearance
  - Absolute contraindications (none present)
  - Relative contraindications (none present)
  - Cancer specific contraindications (none present)√
  - Monitoring equipment available

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LIMITATIONS OF THESE AVAILABLE GUIDELINES

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- Pre-Participation screening
  - Not recommended
    - MSSE. 2010;42:1409
- PT's take histories!!

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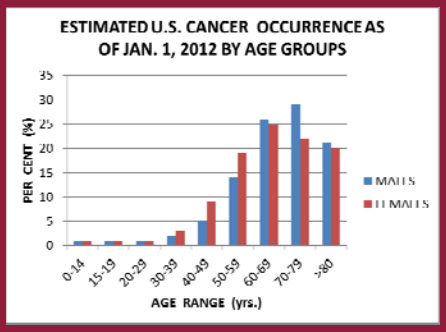
ESTIMATED U.S. CANCER OCCURRENCE AS OF JAN. 1, 2012 BY AGE GROUPS



Segal et al. CA Cancer J Clin 2012

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COMORBIDITIES

Prevalence of Cardiovascular, Pulmonary-Related, and Specific Coexistent Diseases for the Four Types of Cancers

	Breast (n = 119)	Lung (n = 29)	Prostate (n = 88)	Colon (n = 65)	All four cancers (n = 301)
Presence of comorbid disease	82%	83%	84%	75%	81%
CV-related comorbidity	57%	52%	67%	55%	59%
Pulmonary-related comorbidity	18%	24%	18%	11%	17%
Hypertension	48%	24%	50%	46%	45%
Coronary heart disease	8%	28%	13%	13%	12%
Angina	4%	7%	10%	6%	6%
History of myocardial infarction	8%	31%	10%	9%	11%
Heart disease NOS	14%	10%	19%	8%	13%
Stroke	7%	3%	7%	8%	7%
Emphysema	4%	10%	7%	8%	6%
Asthma	12%	10%	7%	5%	9%
Peptic ulcer	17%	31%	15%	9%	16%
Diabetes NOS	18%	14%	8%	14%	14%
Insulin-dependent diabetes	3%	10%	1%	8%	7%
Bronchitis	13%	10%	16%	8%	13%
Renal insufficiency	3%	3%	6%	3%	4%
Liver insufficiency	3%	3%	2%	6%	3%
Arthritis	52%	34%	42%	44%	46%

Ko & Chaudhry. J Surg Res. 2002;105:53

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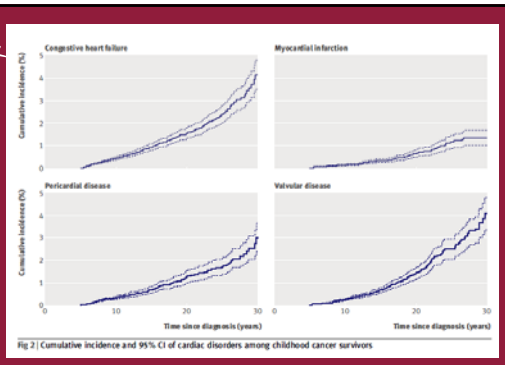

Mulrooney D, et al. BMJ, 2009

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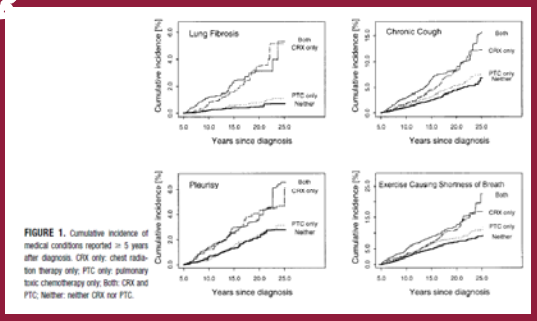

Mertens et al. Cancer. 2002;95:2431

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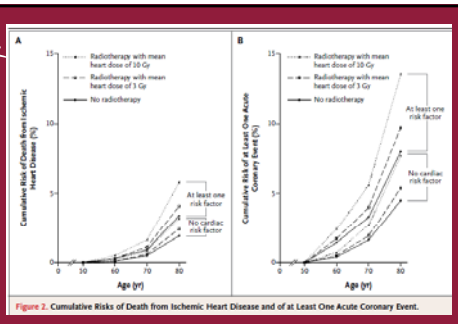

Darby et al. New Eng. J Med. 2013;381:987.

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ELEVATED FALL RISK

- Prostate cancer survivors (age >70 years) receiving androgen deprivation therapy
  - 22% had >1 fall over 3 months, vs. 6% to 9% in general elderly populations
    - Bylow K et al. Urology. 2008; 72: 422.
- Breast cancer survivors (age <70 years) s/p chemotherapy, + or - hormone therapy
  - 75% had >1 fall over 18 months, vs. 45% of the controls
    - Winters-Stone KM. Arch Phy Med Rehab. 2009;92:646.

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FALLS ASSESSMENT

- Berg Balance Test
- Dynamic Gait Index
- Timed Up and Go
- Elderly Falls Screening Test
- "Have you fallen in the past month?"

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BALANCE ASSESSMENT TOOLS

- Chair stands
- Forward Reach
- Timed Up and Go
- Gait speed assessment

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- "Exercise testing not required for low to moderate exercise intensity, flexibility activities or resistance exercises"

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EXERCISE TESTING/PERFORMANCE STATUS

- Submaximal Aerobic Tests:
  - 6- min walk
  - Modified Bruce & Modified Bruce Protocol
  - Single Stage Submaximal Treadmill Walking Test
  - Peak Cycling Test
  - McCardle's Step Test
    - Noonan V, Dean E. Phys Ther. 2000;80:782.

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EXERCISE TESTING/PERFORMANCE STATUS

- Strength Testing

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ACSM EXERCISE GUIDELINES FOR CANCER SURVIVORS

- "Avoid inactivity"
- "Allow adequate time to heal after surgery. The number of weeks required for surgical recovery may be as high as 8."
- "Resume normal daily activities as quickly as possible after surgery"

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RISKS ASSOCIATED WITH INACTIVITY

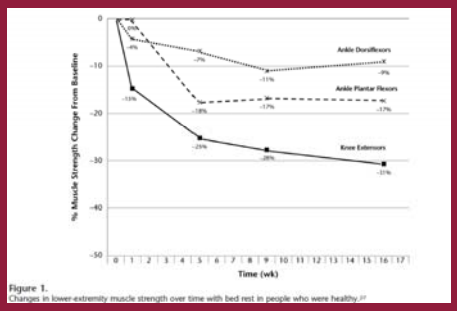

Figure 1.
Changes in lower-extremity muscle strength over time with bed rest in people who were healthy.[27]

LeBlanc et al. J. Appl. Physiol. 1992;73:2172

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Special Series on Rehabilitation for People With Critical Illness: Using Quality Improvement to Translate Research Into Practice

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STRENGTH (WEAKNESS), WASTING

TABLE 2. Preexercise medical assessments and exercise testing.

Cancer Site	Breast	Prostate	Colon	Ad
General medical assessments recommended before exercise	Recommend evaluation for peripheral neuropathies and musculoskeletal morbidities has been hormonal therapy, recommend evaluation of fracture risk. Individuals w discern what is safe before starting exercise. Individuals with known cardiac cond the safety of exercise before starting. There is always a risk that metastasis to th undetected. This risk will vary widely across the population of survivors. Fitness to discern this likelihood. However, requiring medical assessment for metastatic recommended because this would create an unnecessary barrier to obtaining t survivors, for whom metastasis and cardiotoxicity are unlikely to occur.			
Cancer site–specific medical assessments recommended before starting an exercise program	Recommend evaluation for arm/shoulder morbidity before upper body exercise.	Evaluation of muscle strength and wasting.	Patient should be evaluated as having established consistent and proactive infection prevention behaviors for an existing ostomy before engaging in exercise training more vigorous than a walking program.	

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WASTING

- Wasting (cachexia)
  - Not equivalent to anorexia
  - Not equivalent to weakness
  - Wt. loss > 5% past 6 months or wt. loss > 2% with a BMI < 20 kg/m^2
  - Assessed by measuring lean body mass
  - Associated with a number of cancer diagnosis

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EXERCISE PRESCRIPTION

- "Recommendations are the same as age-appropriate guidelines from the PAG for Americans"
- FITT principle
- ∑ = Volume of exercise

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EXERCISE PRESCRIPTION

- Mode: Something safe, available and that the subject wants to do!
- Frequency: Work up to 5X/week for a total of 150 min or more
- Duration
  - 30 min/session
  - Conditioning status of patient

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EXERCISE PRESCRIPTION

- Intensity:
  - % of Heart Rate Reserve (HRR)
  - HRR = Estimated HR_{max} –$HR_{resting}$
  - 30%-75% of HRR
  - 5-6/10 (RPE)
- Progression
  - 1st progress duration
  - Then increase intensity

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EXERCISE PRESCRIPTION

- Progression should be slower and more gradual for deconditioned patients
- Flexible: "good day" and "bad day" treatment days
- Psychosocial benefits
- Barriers to exercise

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WK	DURATION	INTENSITY	INTENSITY	FRE-QUENCY	FRE-QUENCY
1	5 MIN, REST 5 MIN	30-45% HRR	1-3	2x/DAY	5 DAYS/WK
2	10 MIN	30-45% HRR	1-3	2 X/DAY	5 DAYS/WK
3	15 MIN	30-45% HRR	1-3	1X/DAY	3-5 DAYS/WK
4	20 MIN	30-45% HRR	1-3	1X/DAY	3 DAYS/WK
5	25 MIN	45-60% HRR	3-4	1X/DAY	3 DAYS/WK
6	30 MIN	45-60% HRR	3-4	1X/DAY	3 DAYS/WK
7	30 MIN	45-60% HRR	4-6	1X/DAY	4-5 DAYS/WK
8	30 MIN	45-60% HRR	4-6	1X/DAY	4-5 DAYS/WK

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SUMMARY

- Available exercise guidelines:
  - are useful for the rehabilitation professional
  - identify unique roles for rehabilitation professionals in reconditioning the cancer survivor
  - should leave the rehabilitation professional a bit perplexed by what is missing
  - require that the rehabilitation professional use their clinical decision making skills to safely incorporate exercise into your treatment plans.

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Thank you for the privilege of the podium.

Oncology Section
Celebrate Living

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