Addressing Accelerated Aging, Functional Limitations, and Comorbidities across the Lifespan from Pediatric to Older Cancer Survivors

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Objectives

• Accelerated Aging
• Significance of Diet/Exercise Interventions
• Considerations in Delivery of Diet and Exercise Interventions
Significance
Young & Old Cancer Survivors

- Overall Relative 5-year Survival Rate >83%
- ~390,000 (2.5% of Survivors)
- Greater Future Life Years

- Overall Relative 5-year Survival Rate >69%
- Over 9.6 M (62% of Survivors)
- Fewer Future Life Years

Fewer Survivors with More Potential Life Years

More Survivors with Fewer Potential Life Years
### Late Effects of Cancer

**Henderson TO, Ness KK, Cohen HJ ASCO Educ Book 2014**

<table>
<thead>
<tr>
<th>General</th>
<th>Sarcopenia</th>
<th>Fatigue</th>
<th>2nd Cancers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endocrine</td>
<td>Obesity</td>
<td>Metabolic Syndrome</td>
<td>Osteoporosis</td>
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<tr>
<td>Cardiovascular</td>
<td>Coronary Artery Disease</td>
<td>Cardiomyopathy</td>
<td>LV Dysfunction</td>
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<td>Neurologic</td>
<td>Stroke</td>
<td>Cerebellar Dysfunction</td>
<td>Cognitive Dysfunction</td>
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<tr>
<td>Hepatic</td>
<td>Decreased Hepatic Function</td>
<td>Increased Infections</td>
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<tr>
<td>Immune System</td>
<td>Increased Infections</td>
<td>Myelodysplasia</td>
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<tr>
<td>Pulmonary</td>
<td>Interstitial Pneumonitis</td>
<td>Obstructive Lung Disease</td>
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<tr>
<td>Renal/Genitourinary</td>
<td>Dyspareunia</td>
<td>Erectile Dysfunction</td>
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<tr>
<td>Sensory</td>
<td>Cataracts</td>
<td>Decreased Vision</td>
<td>Hearing Loss</td>
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<td>Tinnitus</td>
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</tbody>
</table>

- Hypothyroidism
- Premature Menopause
- Arrhythmias
- Percarditis
- Valve Dysfunction
- Leukoencephalopathy
- Peripheral Neuropathy
- Intestinal Obstruction
- Asplenia
- Pulmonary Fibrosis
- Restrictive Lung Disease
- Glomerular Toxicity
- Tubular Dysfunction
## Adherence to Guidelines

### Young & Old Cancer Survivors

#### Childhood Cancer Survivors
- Overall Prevalence of Overweight and Obesity not higher (exception: Brain Cancer/ALL)
- Higher Risk of Sarcopenia
- 54-84% Insufficiently Active
- 40-70% Suboptimal Diets

#### Older Cancer Survivors
- Up to 71% of Adult Cancer Survivors Overweight & Obese
- Higher Risk of Sarcopenia
- 53-70% Insufficiently Active
- 52-85% Suboptimal Diets

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Sarcopenia: Loss of Muscle Mass and Strength

• Steady loss of muscle mass with age 0.5-1.0% per year after age 50

• Resting Metabolic Rate tracks with lean body mass

• Almost all studies of individuals diagnosed with cancer show adverse body changes over time and as compared to controls.

• Weight loss can exacerbate sarcopenia – exercise can hinder it.

CT x-sections of the thigh
20 year-old vs. 80 yr old men

Frailty Prevention
Encourage lifestyles that maintain neuromuscular control, promotes muscle strength, and optimize energy metabolism

Frailty: Insufficient reserve to recover

In study of 261 older Breast Cancer Patients, odds of frailty increased with higher BMI 1.12 (95% CI: 1.01;1.19) p=.003

Bennett et al. Oncol Nurs Forum 40:E126, 2013
**Weight Management**

**Children**
- **Concerns:** Stunting, Sarcopenia
- **Approach:**
  1) Behavioral
     "Grow into Weight"
  2) Minimal Energy Restriction
     ½ pound/week

**Adults**
- **Up to 2 Pounds/week**
- **500-1000 kcal/day deficit**

**Older Adults**
- **Concerns:** Sarcopenia, Functional Decline
- **Approach:**
  1) Energy Restriction
     500-750 kcal/day deficit
  2) Resistance Training

References:
- Barlow SE Expert Panel. Pediatr 2007;120;164S
- NHLBI 2013, 2013 AHA/ACC/TOS, ACS 2012
Physical Activity

Avoid inactivity
PA of ≥150 min MVPA/week
Resistance Training 2 x week
Adaptations to Treatment and Common Comorbidities
Clearance/Training Certification
ACMS Guidelines for Physical Activity for Cancer Survivors
Schmitz KM et al. MSSE 2010
ACS Guidelines 2012

Children
• CDC Guidelines endorse ≥300 min MVPA/week
• Strength training within a sports curriculum and supervision
  Pediatr 2008:121,835
• Review suggests positive effects on composition, fitness

Older Adults
• ACSM Guidelines for Older Adults Endorse Strength Training 2-3/week
• Light physical activity increases Physical function
  Blair et al. MSSE 46:1375, 2014
• Review shows PA safe, effective in improving strength and function
  Klepin HD Interdiscip Gerontol 2013
# Considerations in Delivering Diet and Physical Activity Programs to Young and Old Cancer Survivors

<table>
<thead>
<tr>
<th>Young</th>
<th>Solution</th>
<th>Old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rare Cancers, Geographically Dispersed</td>
<td>Distance-Medicine Based Approaches</td>
<td>Transportation Issues</td>
</tr>
<tr>
<td>Unaware of Increased Risk</td>
<td>Need to Increase Awareness</td>
<td>Unaware of Increased Risk</td>
</tr>
<tr>
<td>Lower Health Literacy</td>
<td>Appropriate Reading Level</td>
<td>Lower Health Literacy</td>
</tr>
<tr>
<td>Functional/Sensory Deficits</td>
<td>Large font, screen size, buttons, &amp; keyboards; volume control; brief modules, cognitive/computer pre-training and/or provision</td>
<td>Functional/Sensory Deficits</td>
</tr>
<tr>
<td>Value Preferences for Immediate Gratification</td>
<td>Incremental Goals with ample reinforcement</td>
<td>Value Preferences for Immediate Gratification</td>
</tr>
<tr>
<td>Caregivers</td>
<td>Dyadic Approaches</td>
<td>Caregivers</td>
</tr>
<tr>
<td>Game/Play-based</td>
<td>Need for High Engagement</td>
<td>Preference for Holistic Programs that have Meaning &amp; Involve Others</td>
</tr>
<tr>
<td>Numerous treatment sequelae</td>
<td>Tailor to extant health conditions</td>
<td>Increased cumulative disease burden</td>
</tr>
</tbody>
</table>

Fit 4 Life: 38 Childhood Cancer Survivors with Acute Lymphoblastic Anemia (ACS-MSRG)

- 4-month, 2 arm, single blinded RCT
- Sample: Children ages 8-18
- Weight loss via caloric restriction (logs), increased physical activity (1 hr/day, 15,000 steps)
- Delivered via the Web, phone and text messaging
- Safe, retention 92%.
- At follow-up: Intervention arm lost 0.1 kg vs gain of 1.4 kg among controls (p=.06)

Huang JS et al. Pedriatr Blood Cancer 2014;61:894
RENEW: 641 Older Breast, Prostate & Colorectal Survivors
(R01 CA106919)

• Mean Age: 73 (65-87)
• 2-year, 2-arm, wait-list, cross-over, single-blinded trial
• Promoted Weight Loss 0.5 kg w^{-1}
  Calorie budget (logs), portion control, & volumetrics (Villareal et al. Obes Res 2005:31;1849)
• Healthful Diet (ACS 2003 Guidelines)
• Resistance/Aerobic Physical Activity

Morey MC et al. JAMA 2009: 301;1883.
Demark-Wahnefried et al. JCO 2012; 39:2354
Conclusions

• There are several considerations in delivering programs to younger and older cancer survivors

• Programs must address the health risks in these populations: e.g., frailty, sarcopenia

• Programs also need to overcome well-known barriers: distance, literacy, functional deficits, and address preferences to optimally engage.