Exercise is Medicine for Cancer Management

Presented by:
Robert Newton, PhD
Edith Cowan University, Perth, Australia

"the human genome evolved over at least the last 45,000 years within an environment of high physical activity"
"the current human genome expects and requires humans to be physically active for normal function and health maintenance"
Booth et al, JAP 2000

Major Chronic Disease and the Role of Exercise

Sarcopenia
- Loss of muscle mass and function
- 60% of over 80yrs
- Major cause of loss of independence
- Anabolic exercise most effective strategy to prevent or reverse sarcopenia

Osteoporosis
- Evidence is conclusive
- Lifelong physical activity has strong preventative effect
- Anabolic exercise - greatest efficacy
- Example*
  - 1 year study of strength and endurance training
  - 1.3% increase BMD in training group
  - 1.2% decrease for control

Obesity
- Exercise and diet modification is the ONLY long term solution
- Diet modification has most impact BUT
- Anabolic exercise counteracts muscle and bone loss
- One kilogram fat approx. 32,000 Kj
- Much easier to drop 16,000 Kj energy intake and increase exercise 16,000 Kj per week
- PLUS – all the added exercise benefits!
- Fitness NOT Fatness is the key

**Anxiety and Depression**

- Appropriate physical activity can result in large improvement in anxiety and depression.
- Recent research has shown resistance training to be more effective than GP care in older people with diagnosed depression.

Singh NA. et al. A randomized controlled trial of high versus low intensity weight training versus general practitioner care for clinical depression in older adults. The Journals Of Gerontology. Series A, Biological Sciences And Medical Sciences 2005 Jun; Vol. 60 (6), pp. 768-76.

**Type 2 Diabetes**

- Exercise improves insulin resistance.
- Beneficial for preventing and treating type 2 diabetes.
- 30-50% incidence prevented.
- Aerobic exercise hindered in older, obese, co-morbid patients.
- Resistance exercise safe and effective.


**Alzheimer’s Disease**

- Exercise application across spectrum of problem:
  - Reducing risk in general population – prophylactic
  - Reversing or slowing progression in early stage
  - Maintaining QOL, structure and function in later stages

**Exercise and risk of Dementia**

- Population based-study (n=1740)
- 6.2 years follow up
- Incidence rate of dementia was 13.0 per 1000 person-years (exercise 3 or more times week)
- 19.7 per 100- person-years (exercise fewer than 3 times week)
- Exercise is associated with a delay in onset of dementia and Alzheimer’s disease
- Support the effect of exercise beyond musculoskeletal and cardiovascular benefits.
Exercise is Medicine

114,000 new cases of cancer diagnosed in Australia in 2010.
1 in 2 Australians will be diagnosed with cancer by the age of 85.
Cancer is a leading cause of death in Australia more than 43,000 people are estimated to have died from cancer in 2010.

Cancer in Australia

Physical Activity & Cancer Control Framework

Specific phases along the cancer continuum

Physical activity and cancer risk

- Physically inactive - nearly twice as likely to develop colon cancer
- Active - 30% reduction in the risk of women of all ages developing breast cancer
- Reduces prostate cancer incidence of advanced forms and in older men - 70% reduction if >3 hours vigorous per week
- 20 % reduction in risk of Lung cancer

Survival

Cancer Survival: Time to Get Moving? Data Accumulate Suggesting a Link Between Physical Activity and Cancer Survival

Exercise and Breast Cancer Survival

- 2987 female nurses who were diagnosed with breast cancer
- RR of death 0.5 to 0.6 < 3 MET-hours per week compared 9 or more.
- One MET-hour is equivalent to approximately 1 hour of walking at a normal pace.
- "women with breast cancer who follow the US physical activity recommendations may improve their survival"

Exercise and colorectal cancer survival

- Colorectal cancer patients <3 MET-hours per week of PA compared to 18+
- Adjusted hazard ratio for disease-free survival 0.51 to 0.55.
- Benefit not influenced by sex, BMI, age, or chemotherapy received.
- "physical activity appears to reduce the risk of cancer recurrence and mortality"
Men with ≥ 3 hours per week of vigorous activity had a 49% lower risk of all-cause mortality.

61% lower risk of PCa death

Data from these studies suggest a reduced risk of recurrence of 50% to 60%.

“Such an effect parallels that of trastuzumab for HER-2–positive breast cancer patients, an agent heralded by the oncologic care community and by the Director of the National Cancer Institute, Andrew C. von Eschenbach, MD, as “a major advance and turning point in eliminating suffering and death from cancer.”


Fitness NOT Fatness

Relative Risk of Death – BMI vs Fitness

CRF and %Body Fat on Mortality Risk in 13,155 Hypertensive Men

CVD Mortality Risk by Fitness and BMI Categories

Adapted from Blair. 2010
Sui et al. 2007 JAMA
Jakkic, 2003
Adapted from Blair. 2010
McAuley et al. Am J Hypertension 2009
Church et al. Arch Int Med 2005
Exercise is Medicine

Don’t die of something else!

- Cancer, heart attack, stroke, back pain, bad knees, crook hips, diabetes...
- Your physiology does not care!
- Other chronic disease processes march on.
- Injury and disability will only exacerbate with rest strategy
- Stay active regardless – the alternative is worse!

“There is no pharmacological intervention that holds a greater promise of improving health and promoting independence in the elderly than does exercise”

Evans & Campbell, Journal of Nutrition, 1993

Thank You
r.newton@ecu.edu.au
Exercise is Medicine

Cardiorespiratory Fitness, Risk Factors and All-Cause Mortality, Men, ACLS

Classification of Overweight in Adults According to BMI & Waist Circumference

Thirds of Muscle Strength and Mortality (Aerobic Center Longitudinal Study)
EXERCISE AS MEDICINE FOR BREAST CANCER

Dr. Prue Cowie
Post Doctoral Research Fellow
ECU Health and Wellness Institute

SIDE EFFECTS OF TREATMENT
- Treatments for cancer have significant adverse side effects that have considerable impact on patients

% of breast cancer patients who receive:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>&gt;50%</th>
<th>&gt;50%</th>
<th>&lt;50%</th>
<th>Most</th>
<th>Some</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamoxifen</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Radiation</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hormone therapy</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Health and Wellness Institute

EXERCISE FOR CANCER SURVIVAL
- Evidence from observational studies suggests a reduced risk of breast cancer death of 20-50% if physically active

Holmes et al. Journal of the American Medical Association, 2005

EXERCISE FOR CANCER SURVIVAL

"Such an effect parallels that of trastuzumab for HER-2-positive breast cancer patients, an agent heralded by the oncologic care community and by the Director of the National Cancer Institute as ‘a major advance and turning point in eliminating suffering and death from cancer.’" Dearnak Wahlstedt, Journal of Clinical Oncology, 2006

EXERCISE FOR CANCER SURVIVAL: MECHANISMS

Impact of Exercise on Mammary Tumorigenesis

Murphy et al. Cell Dec, 2011

EXERCISE FOR FATIGUE
- Exercise does not exacerbate cancer related fatigue
- Exercise has been shown to reduce fatigue in:
  - 80% of research studies during treatment
  - 93% of research studies after treatment

Tang et al. J Cancer Surviv, 2013

**EXERCISE FOR FITNESS & STRENGTH**
- Exercise increases aerobic fitness during (88% of studies) and after treatment (93% of studies)
- Exercise increases muscle strength during (100% of studies) and after treatment (100% of studies)

**EXERCISE FOR PHYSICAL FUNCTION**
- Exercise improves physical function during (65-100% of studies) and after treatment (69-71% of studies)
  - Physical function and physical well-being sub-scales of quality of life questionnaires
  - Little research involving objective measures of physical function

**EXERCISE FOR LYMPHOEDEMA**
- Lymphoedema affects ~20-30% of breast cancer survivors
- Historically upper body exercise has been discouraged for women who have or are at risk of lymphoedema for fear of exacerbating the condition

**EXERCISE FOR LYMPHOEDEMA**
- A bout of resistance exercise does NOT cause an increase in swelling or worsening of symptom severity
  - This is the case for both heavier & lighter weights
- Regular resistance exercise over 3 months results in:
  - ↔ swelling (i.e. does NOT increase swelling)
  - ↑ strength
  - ↑ physical function
  - Similar effects observed for both heavier & lighter weights

**EXERCISE FOR QUALITY OF LIFE**
- Exercise has been shown to improve quality of life in:
  - 100% of research studies during treatment
  - 75% of research studies after treatment

**BEYOND PHYSIOLOGICAL CHANGES**
“I have become more agile, I’ve lost a little weight, and have increased my belief in my own capabilities. The program has set new boundaries for me.”

“I am not afraid to go walking or participate in exercise now”
SAFETY OF EXERCISE

- Extensive research supports the safety of exercise during and after breast cancer treatment.
- Clinical trials have consistently shown that there are no adverse side effects from exercise.
- So exercise has the potential to generate improvements in patient outcomes with no adverse side effects.

INTERNATIONAL GUIDELINES

During Treatment
(22 Randomised Controlled Trials)

<table>
<thead>
<tr>
<th>Safety</th>
<th>Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Overwhelming (A)</td>
</tr>
<tr>
<td>Aerobic Fitness</td>
<td>Overwhelming (A)</td>
</tr>
<tr>
<td>Muscle Strength</td>
<td>Overwhelming (A)</td>
</tr>
<tr>
<td>Physical Function</td>
<td>Emerging (B)</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Emerging (B)</td>
</tr>
<tr>
<td>Body Comp</td>
<td>Emerging (B)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Emerging (B)</td>
</tr>
</tbody>
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After Treatment
(32 Randomised Controlled Trials)

<table>
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<tr>
<th>Safety</th>
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<tr>
<td>Anxiety</td>
<td>Emerging (B)</td>
</tr>
<tr>
<td>Body Image</td>
<td>Emerging (B)</td>
</tr>
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PHYSICAL INACTIVITY

- 63-68% of breast cancer survivors do not perform sufficient levels of physical activity (i.e. < 150 mins/week)
- Majority of breast cancer survivors significantly decrease their level of activity after diagnosis with a return to pre-diagnosis levels believed to be highly unlikely

EXERCISE IS MEDICINE FOR BREAST CANCER PATIENTS & SURVIVORS

On present knowledge exercise offers the greatest potential as an adjunct therapy to reverse treatment related side-effects and increase the quality and quantity of life in breast cancer patients & survivors.
EXERCISE IN THE MANAGEMENT OF LUNG CANCER

Carolyn J. McIntyre, Ph.D.

BACKGROUND
- Lung cancer is a prevalent and devastating disease
- Second most common cancer among Australians over age 65
- Leading cause of premature death due to cancer in Australia
- Overall 5-year survival rate 16%, if caught early 49%
- Lung cancer patients often present with less than optimal functional status and QoL

TREATMENTS & DISEASE BURDEN
- Surgery
  - Infection, loss of function, shortness of breath, pain
- Chemotherapy
  - Fatigue, deconditioning, peripheral neuropathies
- Radiation
  - Fatigue, deconditioning, lung tissue damage
- Disease itself
  - Weight loss, appetite loss, muscle wasting, shortness of breath

IMPORTANCE OF PHYSICAL FUNCTIONING
- High risk of disease recurrence - 20-60%
- The ability to tolerate future treatment related to physical functioning
  - Performance status
    - Patients with borderline PS
      - High treatment related toxicity
      - Less benefit from treatment
GOALS OF EXERCISE AND PHYSICAL ACTIVITY
POST TREATMENT LUNG CANCER SURVIVORS

- Restore and maintain function
- Help cope with ongoing side effects
  - Shortness of breath
  - Fatigue
  - Deconditioning
  - Muscle wasting (weakness)
- A series of modifiable targets that could improve outcomes for lung cancer survivors
  - Cardiorespiratory fitness
  - Physical functioning
- What can we do to improve these targets?

QUALITY OF LIFE

- Those meeting physical activity guidelines report significantly higher quality of life
  - 62% report no PA
  - Only 27% currently meeting activity guidelines

EXERCISE TRAINING

- Aerobic training and multidisciplinary programs
- Programs 4-12 weeks
- Single group design, small sample size
- Improvements in fitness, walking ability, fatigue, and quality of life
- ‘Proof of principle’

PROGRESSIVE RESISTANCE EXERCISE TRAINING

- 17 post-treatment lung cancer survivors
- 10-week training program

PHYSICAL FUNCTIONING
WHAT DO PATIENTS SAY?

‘I knew I was in desperate need of physical activity, however did not know where or how to safely start. I was tired, and becoming more tired. Every day activities were getting increasingly difficult. I feel well and emotionally I am happier, although I still have to keep working on becoming stronger and more active.’

Female lung cancer survivor

SUMMARY OF FINDINGS

- Lung cancer survivors benefit from exercise training
- Potential health benefits
- Future research
  - Randomized controlled trials
  - Improve eligibility rates
  - Home based interventions, less intense interventions, medically supervised exercise
  - Longer term interventions, behavior maintenance
  - Physiological mechanisms

ONGOING RESEARCH

- Short-term improvements good...
- Can survivors maintain exercise training?
- Need to investigate strategies to facilitate long-term adherence
- Exercise Training to Improve Physical Functioning and Exercise Adoption in Lung Cancer Survivors: a Randomized Controlled Trial
New Directions and Upcoming Projects

Exercise and Colorectal Cancer
Bone Health and Cancer

Colorectal Cancer
- Second largest cause of cancer death in Australia
- Surgery is usually undertaken either before or after chemotherapy and/or radiation therapy
- Loss of bone and muscle, reduction in strength and physical function
- Increases in fatigue, nausea, pain, anxiety and depression

Colorectal Cancer
- Physical activity and fitness lowers risk of developing
- During treatment, exercise can improve quality of life and psychological health
- After diagnosis, exercise is associated with improved survival and less recurrence.

Colorectal Cancer
- Problem of pre-surgery treatment

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Chemotherapy</th>
<th>Radiation therapy</th>
<th>Surgery</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>During chemo</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During recovery</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before surgery</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Colorectal Cancer
- New direction for exercise
- 10+ weeks of supervised exercise during chemoradiation therapy
- See if they are:
  - better able to cope with the treatment
  - physically better off before surgery
  - recover more quickly after surgery
Bone Loss

- Bone is constantly remodelling
- “Normal” ageing

Breast cancer (Aromatase inhibitors)
- block the production of estrogen
- twice the rate of normal postmenopausal bone loss
- Prostate cancer (ADT)
  - estrogen and testosterone deficiencies
  - 5-10 fold higher rate of bone loss in the first year of therapy than normal bone loss in men

Current drug treatments less than ideal
Exercise that “loads” the bone can be effective in preventing loss
- weight training
- fast walking or jogging

New treatment - vibration (WBV)

Vibration in postmenopausal women
- reduces rate of breakdown
- May lessen potential role in osteoporosis
- 3 Day/Week
- Control
- 1 Day/Week
- 3 Day/Week
Bone Loss

• Two new studies
  – Breast cancer survivors
  – Prostate cancer survivors
• 12 Weeks, 3 days per week
• See if they:
  – have less bone breakdown
  – improve their muscle and balance
Physical Exercise and Prostate Cancer Survivorship

Daniel Galvão, Director ECU Health and Wellness Institute

Established Risk Factor

Prostate cancer is largely associated with aging

Stage Distribution

Five-year Survival Rates

Stage Distribution (%) 5-year Survival (%)

- Localized
- Distant
- All stages

Common Treatments

- Active surveillance: non treatment
- Prostatectomy: surgical removal
- Radiation therapy: external/brachytherapy
- Androgen deprivation: LHRHa, orchiectomy, antiandrogen
- Chemotherapy: metastatic castration-resistant

Common Adverse Effects

- Radiation: sexual dysfunction (impotence), urinary dysfunction (incontinence), bowel dysfunction, fatigue
- Prostatectomy: urinary dysfunction (incontinence), sexual dysfunction (impotence)
- Chemotherapy: cardiovascular, infection, nausea, diarrhea, fatigue

Hormone Treatment

Androgen deprivation (ADT)

- Eliminates testosterone production (LHRHa)
- Improves survival in locally advanced disease and palliates metastases
- Increasingly used in the management of PCa

ADT → Reduces Testosterone → PCa Control

Treatment Side Effects
### PSA, Testosterone, Muscle/Fat Changes at 36 weeks

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>36 weeks</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA</td>
<td>22.6 (3.1)</td>
<td>0.23 (0.05)</td>
<td>-98.2 (0.5)*</td>
</tr>
<tr>
<td>Testosterone</td>
<td>15.1 (0.6)</td>
<td>0.80 (0.03)</td>
<td>-93.3 (0.3)*</td>
</tr>
<tr>
<td>Whole body LM (kg)</td>
<td>55.8 (0.8)</td>
<td>54.4 (0.8)</td>
<td>-2.4 (0.4)*</td>
</tr>
<tr>
<td>ASM (kg)</td>
<td>23.4 (0.3)</td>
<td>22.4 (0.3)</td>
<td>-4.2 (0.5)*</td>
</tr>
<tr>
<td>Whole body FM (kg)</td>
<td>20.8 (0.7)</td>
<td>23.1 (0.7)</td>
<td>+13.8 (2.3)*</td>
</tr>
<tr>
<td>Trunk FM (kg)</td>
<td>12.1 (0.4)</td>
<td>13.1 (0.4)</td>
<td>+12.0 (2.5)*</td>
</tr>
</tbody>
</table>

*p<0.001

### Long-term DXA Changes

- **ITREAT phase**
  - Baseline level
  - +2.3 kg FAT
  - -1.5 kg Muscle

- **POST phase**
  - Absolute change (Kg) over 33 months from BL
  - Whole Body Fat
  - Whole Body Lean

### Testosterone Recovery After ADT

- 26% failed to recover at 24 months
- Odds of regaining eugonadal levels of testosterone reduced by 50% if 70yr

### DXA BMD Regional Changes

<table>
<thead>
<tr>
<th>BMD</th>
<th>9 months change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar spine</td>
<td>-3.9%*</td>
</tr>
<tr>
<td>Total Hip</td>
<td>-1.5%*</td>
</tr>
<tr>
<td>Upper limb</td>
<td>-1.3%*</td>
</tr>
<tr>
<td>Lower Limb</td>
<td>-0.6%</td>
</tr>
</tbody>
</table>

*p<0.001

### Cancer Treatment-Induced Bone Loss

- OSTEOMIMIC® agonist in premenopausal early-stage BCa
- Chemotherapy-induced early-stage BCa
- Hormonal therapy in postmenopausal early-stage BCa
- Early menopause
- Late menopause

![Percentage BMD loss per year](image)
Prevalence of Osteoporosis
Baseline & Yrs On ADT

Overall prevalence of osteoporosis, osteopenia, and normal BMD according to ADT duration.
*Patients had not received ADT at time of BMD measurement.

Relationship Between BMD & Fracture Risk

Risk of Fracture after Androgen Deprivation for Prostate Cancer

Baseline & Yrs On ADT

Impact of Androgen-Deprivation Therapy on Physical Function and Quality of Life in Men With Nonmetastatic Prostate Cancer

Diabetes and Cardiovascular Disease During Androgen Deprivation Therapy for Prostate Cancer

Increased risk associated with Androgen Suppression
AHA/ACS/AUA Science Advisory

Androgen-Deprivation Therapy in Prostate Cancer and Cardiovascular Risk
A Science Advisory From the American Heart Association, American Cancer Society, and American Urological Association

Endorsed by the American Society for Radiation Oncology

Glenn N. Levine, MD, FAHA; Chair; Anthony V. D’Amico, MD, PhD; Peter Bergen, MD, FAHA; Puneet Chad, MD; Robert R. Etkin, MD, FAHA; Nancy L. Kouton, MD, MPH; Richard V. Miller, MD, FAANS; Arthur I. Angiolillo, MD; Matthew R. Smith, MD, MS; Neil Zakai, MD; on behalf of the American Heart Association Council on Clinical Cardiology and Council on Epidemiology and Prevention; the American Cancer Society; and the American Urological Association.

“recognizes the metabolic and cardiovascular risks associated with androgen suppression as significant adverse effects”

Decline in Physical Reserve Capacity

—Normal Aging
—ADT Treated Men

Current Available Treatments

Bisphosphonates are the only established treatment to reverse low BMD (additional toxicities)

NO established treatment to reverse body composition alterations, physical function decline, risk factors for metabolic, cardiovascular complications and frailty during ADT

What Can Exercise Offer?

NO established treatment to reverse body composition alterations, physical function decline, risk factors for metabolic, cardiovascular complications and frailty during ADT

Recent Available Treatments

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What Can Exercise Offer?
Resistance Exercise in Hypogonadal Men (ADT)

Summary of key Results

Lean Mass +1kg EX<CO
Muscle Strength +5-31kg EX<CO
Aerobic Capacity -7sec EX<CO
Dynamic Balance -4sec EX<CO
General Health +12 EX<CO
Vitality +12 EX<CO
Fatigue -11 EX<CO
CRP -3.5 mg/L EX<CO

Quality of Life: SF-36 Profile

Acute Versus Chronic Exposure to Androgen Suppression

Combined Resistance and Aerobic Exercise Program Reverses Muscle Loss in Men Undergoing Androgen Suppression Therapy for Prostate Cancer Without Bone Metastases: A Randomized Controlled Trial

Treatment ADT (24% Radiation)
Design RCT
Sample 57
Intervention 12-week (2x) resistance & aerobic
Protocol 2-4 sets 6-12RM
Primary endpoint lean mass
Disability Condition
0
25
50
75
100
Musculoskeletal Fitness
Physical Reserve Capacity
ADT Sarcopenia-related Disorders
ADT Treated
—Resistance Trained ADT treated
—Normal Aging
Disability Condition
Age, years

Increases Physical Reserve Capacity

BMC Cancer
Study protocol
A phase III clinical trial of exercise modulation on treatment side-effects in men receiving therapy for prostate cancer
Robert U. Noone1,4, Denis R&Drafe1, Nigel Sors1, Robert A. Galsbey1, Gregory L.Palmer1, Bradley W.A., David Ingle2, Suzanne K.Chambury1 and David A. Galvão3
Perth, Joondalup, Fremantle, Mandurah, Bunbury, Brisbane (QLD)

BMC Cancer
Study protocol
A randomized controlled trial of an exercise intervention targeting cardiovascular and metabolic risk factors for prostate cancer patients from the RADAR trial
David A. Galvão1, Nigel Sors1, Denis R. Drafe1, James Denison1,5, David Ingle2, David S. Land1, Greg Loote1, Gillian Duchess1 and Robert E. Newson1
Perth, Fremantle, Joondalup, Mandurah, Bunbury, Newcastle, Nelson Bay, Maitland, Wellington (NZ)

http://www.essa.org.au

Guideline
Prostate Cancer
During and after treatment
Effects of exercise on key endpoints
Results from 12 RCTs

- Evidence category A – Safety
- Evidence category A – Aerobic Fitness
- Evidence category A – Muscle Strength
- Evidence category A – Fatigue
- Evidence category B – Body Size/Composition
- Evidence category B – Quality of Life
- Evidence category B – Physical Function
Exercise is safe during and after cancer treatments
- Results in improvements in physical functioning, QoL and cancer-related fatigue in several cancer survivor groups
- Implications for disease outcomes and survival are still unknown
- Cancer survivors follow PA Guidelines, with specific exercise programming adaptations based on disease and treatment-related adverse effects
- Advice to “avoid inactivity,” even in cancer patients with existing disease or undergoing difficult treatments, is likely helpful

http://www.acsm.org

Guidelines to Implement Exercise Programs

http://www.cancerwa.asn.au/

Translation of Research: Vario Wellness Clinic

- Cancer Survivors Program
- Life Now Cancer Council WA
- Diabetes Program
- Weight loss for Wellness
- Living Longer Living Stronger
- Fighting Fit Veterans
- Osteoporosis Program
- Weight to Go Kids

Research Support:

Prof. Robert Newton (ECU)
Prof. Dennis Taaffe (U Newcastle)
Clinical Prof. Nigel Spry (SCGH)
Clinical Prof. David Joseph (SCGH)
Clinical Prof. James Denham (U Newcastle)
Clinical Prof. David Lamb (U Otago)
Clinical Prof. Frank Gardiner (UQ)
Prof. Suzanne Chambers (CQIld)
Dr. Prue Cormie (ECU)
Dr. Michael Baker (ECU)
Dr. Carolyn McIntyre (ECU)

Thank You!

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