Prehabilitation: Optimizing Patients to Improve Outcomes - Pt. 1

May 19, 2021
Prehabilitation: Optimizing Patients to Improve Outcomes

Presenters:
Clarissa Mathias, MD, PhD
Medical Oncologist, NOB/Oncoclinicas and Hospital Santa Izabel; President Brazilian Society of Clinical Oncology; Chair of IAC ASCO

Zoe Merchant, MSc, MRCOT
Programme Lead Prehab4Cancer and Recovery Programme; Highly Specialist Occupational Therapist Manchester Greater Manchester, United Kingdom

Catherine Granger, PhD, PT, FACP
Associate Professor, Physiotherapy The University of Melbourne and The Royal Melbourne Hospital Melbourne, Australia

Moderator:
Katherine O. Kuhns, AGACNP-BC, FNP-BC
University of Pennsylvania Health System Pennsylvania, United States of America
Disclosures

None of the planners, reviewers and staff for this activity reported any relevant financial relationships.
Physiological Benefits of Pre-Habilitation The importance of being fit for treatment / surgery

Clarissa Mathias
Brazil
My mission today:

Convince you that our patients need to exercise
Major impairment in Activities of Daily Living (ADLs) due to their lung cancer\(^1\)

Persistent physical and psychological impairments\(^2\)

Most patients do not meet physical activity recommendations before or after treatment\(^2\)

\(^1\)Sung M et al. *Clin Lung Ca* 17; \(^2\)Granger C. *J Physioth* 16; \(^3\)Cavalheri V. *Int Med J* 13; \(^4\)Dennett A. *Asia Pac J Clin Oncol*
Major impairment in Activities of Daily Living (ADLs) due to their lung cancer

Persistent physical and psychological impairments

Most patients do not meet physical activity recommendations before or after treatment

Usual care does not normally include exercise training or pulmonary rehabilitation

How can we incorporate exercise practices into patient’s lives?

- Prevent Cancer
- Improve symptom management
- Improve surgical outcomes
How can we incorporate exercise practices into patient’s lives?

Prevent Cancer

Improve symptom management

Improve surgical outcomes
Can we prevent lung cancer with exercise?

16 studies examining physical activity and lung cancer risk

- 12 cohort studies pooled risk reduction: 23%
- 04 case-control studies pooled risk reduction: 38%

Physical activity and lung cancer risk

Risk reduction, meta-analysis of 11 studies comparing highest versus lowest levels of leisure-time physical activity, (adjusting for smoking intensity):

- Moderate-intensity, OR=0.87 (95% CI: 0.79–0.95)
- Vigorous-intensity, OR=0.70 (95% CI: 0.62–0.79)

Relative risk and 95% confidence intervals comparing highest versus lowest levels of physical activity and cancer risk reduction
Mechanistic Models

pathways relating to:

- Sex hormones
- Metabolic hormones
- Inflammation and adiposity
- Oxidative stress
- DNA repair
- Xenobiotic enzyme systems
- Immune function
During exercise (particularly moderate-intensity aerobic)

16 studies examining physical activity and lung cancer risk

- **T-Cell populations** transiently rise

- **NK Cell populations** and activity transiently rise

- **Neutrophil quantity** and activity also transiently rise

Chronic bouts of physical activity:
inverted ‘J-curve’ such that optimal immune function is achieved with moderate-intensity physical activity and sedentary and vigorous-intensity below optimal immune-system function
Proposed role of physical activity and exercise on polarization of macrophages in tumor microenvironment:

Physical activity preferentially polarizes tumor-associated macrophages (TAMs) to a M1 phenotype with anti-tumor effects.

Lack of physical activity results in the preferential polarization of TAMs to the M2 phenotype, which supports tumor growth, local invasion and metastasis.

Prospective cohort study: association between cardiorespiratory fitness (CRF), lung cancer incidence and cancer mortality in men.

- Maximal exercise testing: 4920 men (59.2 ± 11.4 years) free from malignancy at baseline.
Prospective cohort study: association between cardiorespiratory fitness (CRF), lung cancer incidence and cancer mortality in men.

- Maximal exercise testing: 4920 men (59.2 ± 11.4 years) free from malignancy at baseline.

- Follow-up 12.7 ± 7.5 years: 105 (2.1%) participants diagnosed with lung cancer and 83 (79%) of those died from cancer after 3.6 ± 4.6 years from diagnosis.
Prospective cohort study: association between cardiorespiratory fitness (CRF), lung cancer incidence and cancer mortality in men.

- CRF: and independently associated with cancer outcomes
- 1-MET increase and categories of moderate and high CRF

<table>
<thead>
<tr>
<th>Lung Cancer Incidence</th>
<th>Lung Cancer Mortality</th>
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<tbody>
<tr>
<td>10%</td>
<td>13%</td>
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<tr>
<td>47%</td>
<td>58%</td>
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<tr>
<td>65%</td>
<td>76%</td>
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Prospective cohort study: association between cardiorespiratory fitness (CRF), lung cancer incidence and cancer mortality in men.

Individuals diagnosed with lung cancer and at moderate or high CRF categories at baseline exhibited longer survival time (p < 0.001)
How can we incorporate exercise practices into patient’s lives?

- Prevent Cancer
- Improve symptom management
- Improve surgical outcomes

- Preoperative exercise in patients undergoing lung resection, compared with control

Postoperative Complication Rates

RR 0.52

Length of Hospital Stay

−2.86 days

Perioperative Rehabilitation in Operable Lung Cancer Patients (PROLUCA): A Feasibility Study

Sommer, MS et al. Integrative Cancer Therapies 2016, Vol. 15(4) 455–466
Forty patients (of 124 screened; 32%) were included and randomized into the 4 groups

Postoperative Exercise Completion

73%

Sommer, MS et al. Integrative Cancer Therapies 2016, Vol. 15(4) 455–466
Results: Perioperative Rehabilitation in Operable Lung Cancer Patients (PROLUCA): A Feasibility Study

- Early postoperative exercise program for patients with NSCLC: safe and feasible
- Fast-track set up, a preoperative home-based exercise program: not feasible for this population.

Sommer, MS et al. Integrative Cancer Therapies 2016, Vol. 15(4) 455–466
Early initiated postoperative rehabilitation reduces fatigue in patients with operable lung cancer: a randomized trial

- Two-armed randomized controlled trial: early initiated postoperative rehabilitation (14 days after surgery (ERG)) or a control arm with late initiated postoperative rehabilitation (14 weeks after surgery (LRG))

- Primary endpoint: change in maximum oxygen consumption (VO2peak) from baseline to post intervention 26 weeks following lung resection
Outcomes: ↓ pulmonary complications & length of stay after surgery

Post op pulmonary complications

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>SMD [95% CI]</th>
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<tr>
<td>Huang, 2017</td>
<td>-0.35 [-0.78, 0.08]</td>
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<tr>
<td>Lai, 2017</td>
<td>-0.44 [-0.87, -0.01]</td>
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<tr>
<td>Lai, 2017</td>
<td>-0.24 [-0.57, 0.09]</td>
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<tr>
<td>Stefanelli, 2013</td>
<td>-0.19 [-0.72, 0.34]</td>
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<tr>
<td>RE Model</td>
<td>-0.30 [-0.51, -0.10]</td>
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Favors Intervention | Favors Control

Hospital length of stay

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<tr>
<th>Author(s) and Year</th>
<th>Relative Risk [95% CI]</th>
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<td>Benzo, 2011</td>
<td>0.18 [0.03, 1.22]</td>
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<td>0.57 [0.19, 1.75]</td>
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<td>0.52 [0.32, 0.85]</td>
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RE Model  (I^2 = 0.0%)  
Favors Intervention | Favors Control

Relative Risk [95% CI]: 0.50 [0.39, 0.66]
How can we incorporate exercise practices into patient’s lives?

- Prevent Cancer
- Improve symptom management
- Improve surgical outcomes
Deleterious sequelae of treatment

- Fatigue
- Muscular weakness
- Deteriorated functional capacity
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Hope to have convinced you that, by stimulating exercise practices, **WE ARE ABLE TO**

- Prevent Cancer
- Improve symptom management
- Improve surgical outcomes
How to implement a region wide prehabilitation programme: Prehab4Cancer & Recovery Programme in Greater Manchester, UK

ZOE MERCHANT (Programme Lead/Highly Specialist OT)
IASLC webinar
Wednesday 19th May 2021

@Prehab4Cancer / @ZoeMerchantOT
Introduction

- Prehab4Cancer Programme Lead, GM Cancer Alliance
- Highly Specialist Occupational Therapist NHS

Areas Of Experience:

NHS Transformation
Mental Health
NeuroRehabilitation
STROKE
Cancer
PREHABILITATION & REHABILITATION
DEMENTIA (Frailty)
Innovation
Education
Research

@zoemerchantOT
GM health is poorer than the UK average, with more people here suffering heart disease and cancer.

One in five people in Greater Manchester live in the one of country’s most disadvantaged areas.

More than two thirds of early deaths in our region are caused by smoking, alcohol dependency, poor diet and air pollution.

‘Invisible patients’ are more common in deprived areas and present as emergencies with advanced cancers.
The GM Model – DevoManc

Greater Manchester:
2.8 million people, 500 square miles

Andy Burnham, Mayor of Greater Manchester.
Google Images – BBC News
What is Prehabilitation?

The preparation for the physiological and psychological challenges of cancer treatment.

Prehabilitation and rehabilitation are essential for reducing the future needs of people with cancer.

Benefits:
- Shortened recovery
- Addresses Sarcopenia
- Reduce treatment-related complications
- Improve adherence & completion of treatment
- Improve quality of life
- Transition to lifelong habit of physical activity

Treanor et al. Journal of Cancer Survivorship. Meta-analysis
Priorities identified by patients:

- Energy Level
- Sensation of Pain
- General Physical Endurance
- Carrying out daily routine

WHO International Classification of Function, Disability and Health
* 69 Published guidelines based on international best practice and evidence base
* 60% of cancer survivors need rehabilitation based on measurable morbidity – only 2 to 9% referred for rehabilitation
* Multidimensional, interdisciplinary rehabilitation is optimal model of care
* Use of PROMS – supports understanding around dysfunction and strengthens argument for prehab and rehab needs of people affected by cancer
Macmillan/RCOA/BDA Prehab Guidance 2019

WORKFORCE

Prehabilitation should be delivered by a multidisciplinary team working within a described framework (see below) using a combination of registered professionals (e.g., dietitians, occupational therapists, physiotherapists, psychologists) and unregistered professionals (e.g., rehabilitation/therapy support workers, healthcare assistants, fitness instructors) where there is scope to delegate some responsibilities (as well as caregivers, family, wider support networks) according to agreed and documented local arrangements:

- Screening and monitoring should be undertaken by registered health and care professionals or by unregistered health and care professionals through delegated authority. Screening, and monitoring of health and care outcomes.

CLINICAL LEADERSHIP

Health and care professionals should understand and communicate the importance of prehabilitation through leadership and advocacy. Service transformation through effective clinical leadership underpins the development of effective prehabilitation for people with cancer. Prehabilitation education related to supporting those with cancer in nutrition, exercise, psychology, and behavioral change, should be integrated throughout the undergraduate and postgraduate training of health and care professionals working with those with cancer and other relevant training programmes.

EXERCISE

NUTRITION

WELLBEING
Principles and guidance for prehabilitation within the management and support of people with cancer

In partnership with
NIHR | Cancer and Nutrition Collaboration
RCOA | Royal College of Anaesthetists
MACMILLAN CANCER SUPPORT

6. Prehabilitation in the cancer care pathway


ii) An example of targeted interventions

Mr Jones

Mr Jones is a 72 year old gentleman who lives alone. His two daughters live nearby. He has been diagnosed with oesophageal cancer and has commenced neoadjuvant chemotherapy, prior to his surgery, which is planned to take place in three months. He is a retired bus driver and leads a sedentary lifestyle, occasionally walking to his local shop for the paper. He attended his first assessment clinic within his prehabilitation programme and was stratified into the ‘Targeted’ group for exercise and nutrition with universal intervention for psychology.

Exercise: Free gym membership. To begin with twice a week Mr Jones attended supervised HIIT (High Intensity Interval Training) exercise sessions with three other prehabilitation participants who live in his area. These sessions were prescribed by a qualified cancer exercise expert and graded to his ability. They will be increased in effort and frequency to three times a week once he finishes his chemotherapy and is waiting for his surgery. He is also encouraged to go for a 20–30 minute walk on his ‘rest’ days, wearing the heart rate monitor chest belt he has been given as a prompt.

Nutrition: Medium risk identified via screening. Instructors notified Mr Jones’ referer who in turn has referred him to be assessed by the oesophagogastrectomy specialist dietitian within his hospital. The instructors have given Mr Jones a comprehensive cancer booklet aimed at patients who may be malnourished. They will continue to complete weekly nutritional screening and provide further dietary advice in relation to the exercise he is doing and liaise with the hospital team.

Psychological support: Mr Jones appears to be coping well at present.
**Governance Structure**

- **GM Health & Social Care Partnership**
  - GM Cancer Board
  - Programme Assurance Board

- **Steering Group**
  - Chair: Wendy Makin

- **GM Cancer**
  - Prehab4Cancer project team
    - Clinical Director: John Moore
    - Programme Lead: Zoe Merchant
    - Primary Care Lead: Karen McEwan

- **GM Active Board**
  - Salford Community Leisure (Host)

- **Performance Review & Implementation Group**

- **Research**

- **Digital**
  - Health Innovation Manchester

- **AHP Advisory Board**
  - Chair: Zoe Merchant

- **Wellbeing Expert group**

- **Nutrition Expert group**

- **GM Cancer Pathway Boards**
  - Colorectal Subgroup
    - Chair: Gemma Faulkner
  - Lung Subgroup
    - Chair: Matt Evison
  - Oesophago-Gastric Subgroup
    - Chair: Javed Sultan
  - Head & Neck Subgroup
    - Chair: TBC

- **Exercise Expert group**

- **Line Management**

- Please note: all groups listed have people affected by cancer within their membership.
Embedding Prehab/Rehab into NHS cancer clinical treatment pathways:

- COLORECTAL
- LUNG
- OESOPHAGO-GASTRIC

2 years Cancer Transformation Funding:
2000 patients prehab and rehab
Universal & targeted pathways
From ALL GM Boroughs
***10 referring NHS hospital provider trusts***

Single Point of Access Referral Portal – 48 hour turnaround:
https://prehab4cancer.co.uk/how-to-refer/
At the point of diagnosis:
- Generic information suitable for all cancer diagnosis
- Specific information for prehab

Giving permission and encouragement to be active:
- Empower patients – help them take an active role in treatment
- Consistent message from all professionals

Encourage patients to participate:
- Appointment letters to facilitate time off work

Information for Patients & Relatives

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- Appointment letters to facilitate time off work

Help to PREPARE YOURSELF for cancer treatment

What is Prehab4Cancer and recovery programme?
Prehab4Cancer is a free exercise, nutrition and wellbeing scheme designed by a team of NHS professionals and exercise experts, based on latest research. The scheme is delivered in leisure centres across Greater Manchester, for people to access close to where they live. The aim is to help you to cope with cancer treatment and feel better, physically and mentally. It is designed to help people take an active role in their cancer care and live as well as possible with and beyond cancer.

The programme includes:
- Exercises to suit your level of ability and fitness
- Nutritional assessment and advice
- Mental wellbeing support and onward psychological referral if needed
- 2/3 weekly sessions prior to treatment
- Support to return to exercising after your cancer treatment
- Bring your friends or family members and most others in a similar situation
- Free access to your local leisure facilities before and after treatment for an agreed time period

For more information contact the team:
Tel: 07719 902 037
Email: prehab4cancer@nhs.net
Website: www.gmactive.co.uk/prehab4cancer

PREHAB 4 CANCER

in Greater Manchester

Why have I been referred to the Prehab4Cancer and recovery programme?
Prehabilitation is the medical term which describes preparing for cancer treatment. It has been recommended by doctors and other healthcare professionals involved in your care that you undertake prehabilitation alongside your planned medical interventions.

Will I be able to do the exercises that are given to me?
The NHS clinical team delivering the scheme are friendly and experienced. They are qualified in cancer rehabilitation. They will:
> Assess you regularly
> Take into consideration your current level of ability and needs such as other health conditions
> Give you exercises designed for you
> Support you to take an active role in your cancer care
> Plan exercises designed to improve your fitness levels and muscle strength leading up to your treatment
> Put your safety first
> Take any concerns to your clinical cancer team

Is it safe for me to exercise when also having cancer treatment?
Latest research shows it is safe and recommended to do exercise when you are undergoing cancer treatment.

Family members, carers and friends:
Supporting a loved one who is going through cancer treatment can be uplifting and worrying. It can be difficult to know how best to support them. This programme promotes the importance of people preparing for their cancer treatment. You are actively encouraged to go to its appointments with them and even join in with the exercises. Your practical and emotional support will help motivate your family member or friend. Your support can make all the difference.

How this will HELP YOU:
- Better response to treatment
- Quicker recovery
- Fewer problems during treatment
- Reduced anxiety and improved mood
- Improved energy levels
- Take an active part in your cancer care
- Lower chance of cancer recurrence
- Improve your general fitness and other health conditions
- Be able to do your normal activities
- Gender, specific or tailored packages available if required

HOW TO ACCESS the programme:
- All participants are referred by a healthcare professional involved in your care
- A GM Active team member will contact you within a couple of working days to confirm your details and arrange your first appointment
- Your first appointment will be a couple of working days after and will take place in a leisure centre close to your home
- Contact the GM Active team or a healthcare professional who gave you this leaflet for further information

“I enjoyed the gym... I felt like I was making a contribution to my own wellbeing”
* Co-production

* Use of behaviour change approaches to encourage uptake of Prehabilitation and for effective engagement/delivery
The Inter-Disciplinary TEAM (IDT)

- Cancer Nurse Specialists
- Physiotherapists
- Macmillan Cancer Navigators & Support Workers
- Dieticians
- GPs & Secondary Care Medical teams
- Psychologists & Mental Health practitioners
- Fitness Instructors/Exercise Specialists (Leisure)
- Surgeons, Oncologists, Anaesthetists
- Occupational Therapists
- Exercise Physiologists & Sports Exercise Medicine
Programme Manager – Kirsty Rowlinson-Groves

Team administrator

P4C Specialist
Rob Mentha
Wigan & Stockport

P4C Specialist
Jack Murphy
Salford & Trafford

P4C Specialist
SJ Hurst
Oldham & Rochdale

P4C Specialist
Karly Baguley
Bolton & Bury

P4C Specialist
Ash Rowlands
Manchester & Tameside

3 x Level 3 Gym Instructors –
Eilish Senior; Stuart Barker; Leanne Thetford
<table>
<thead>
<tr>
<th>Level</th>
<th>Group</th>
<th>Assessment</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All the health and social care professionals</td>
<td>Recognition of psychological needs</td>
<td>Effective information giving compassionate communication and general psychological support. Solution focused.</td>
</tr>
<tr>
<td>2</td>
<td>Health and social care professionals with additional expertise</td>
<td>Screening for psychological distress</td>
<td>Psychological techniques such as problem solving, fatigue management etc.</td>
</tr>
<tr>
<td>3</td>
<td>Trained and accredited professional</td>
<td>Assessed for psychological distress and diagnosis of some psychopathology</td>
<td>Counselling and specific psychological interventions such as anxiety management and solution-focused therapy, delivered according to explicit theoretical framework</td>
</tr>
<tr>
<td>4</td>
<td>Mental health specialists</td>
<td>Diagnosis of psychopathology</td>
<td>Specialist psychological and psychiatric interventions such as psychotherapy, including cognitive behavioural therapy (CBT)</td>
</tr>
</tbody>
</table>
UK Clinical Exercise Workforce collaboration

TWO AIMS:

1) Registration of exercise specialist professionals
2) Establish competencies and training required for existing registered professionals (AHPs) to be able to deliver specialist prehabilitation

PRosPER (Personalised Care, Prehab & Rehab training):

https://www.e-lfh.org.uk/programmes/prosper/
Who we are

borton arena
Bury Council
Link4Life
Bolton Community Leisure
Oldham active
Inpiring healthy lifestyles
Salford Community Leisure
MCRactive
Trafford Leisure
GM ACTiVE
Forum
life LEISURE
Greater Manchester Moving
Path of least resistance
Assessment Clinic Overview

Referral Portal 48 Hr Contact

Baseline Assessment 4 working days

Post Chemo Upper GI only

Pre-Op Assessment Within 5 days

Post-Op Assessment 6,8,12 weeks

End of Rehab 12 Week intervention

Functional Capacity
- ISWT or 6 Min Walk
- Hand Grip Dynamometry
- 1 Minute Sit to stand

Questionnaires
- EQ5D-5L
- IPAQ
- Self Efficacy Scale
- Rockwood Frailty
- WHODAS 2.0
- EORTCQLQ-C30

Health checks
- Blood pressure
- Height
- Weight
- Resting HR
- Oxygen stats
- PG-SGA
Comprehensive Personalised Care Model

All age, whole population approach to Personalised Care

Target populations

People with complex needs 5%

People with long term physical and mental health conditions 30%

Whole population 100%

Interventions

Specialist
Integrated Personal Commissioning, including proactive case finding, personalised care and support planning through multi-disciplinary teams, personal health budgets and integrated care record systems.

Targeted
Proactive case finding and personalised care and support planning through general practice. Support to self-manage by increasing patient activation through access to health coaching, peer support and self-management education.

Universal
Shared Decision Making. Enabling choice (e.g. in maternity, elective and end of life care). Social prescribing and community connecting roles. Community capacity building.

Outcomes

Empowering people, integrating care and reducing unplanned service use.

Supporting people to build knowledge, skills and confidence and to live well with their health conditions.

Supporting people to stay well and building community resilience, enabling people to make informed decisions and choices when their health changes.

Programme Model - Surgical/Rad/Chemo

Pre-Treatment

- **Supervised**
  - 3 monitored sessions per week
  - Intensity/Duration/Mod prescribed by specialist

- **Universal**
  - 1-1 session with specialist to prescribe exercise programme
  - Weekly progress updates
  - Independent exercise at local leisure centre

During treatment

- **Continuous**
  - Steady State CV (40-70% Max Hr)
  - Progressing intensity based on HR & RPE
  - MSE combat sarcopenia
  - 3x weekly sessions

- **Re-HIIT**
  - Interval type exercise
  - Work : Active Recovery (60-80+ Max Hr)
  - RPE & HR monitoring
  - MSE combat sarcopenia
  - 3x weekly sessions

- **TREATMENT BEGINS**
  - No expectation or target number of sessions
  - Patients receive support contact calls from specialists with advice and education around fatigue management
  - Offer of supporting patient to maintain some level of activity
  - Any pre prescribed programme is adjust for frequency, intensity & duration to accommodate treatment
  - Constantly adapted programming throughout treatment

Rehab 12 weeks

- **Post Treatment update**
  - Establish plan of action for commencing rehab with Post treatment Assessment

- **Patient centred Rehab**
  - 12 week programme
  - Prescribed exercise programme and supported sessions with specialist
  - Progressive programme to help build patients functional capacity.
  - Focus on patients aims and goals
  - Motivational and behaviour change strategies used to build long-term adherence
Here are some exercises that are safe to try at home. 
Try to complete them 3 times a week.

- **Arm Curls**
  - Stand or sit in a chair.
  - With your arms by your sides with your palms facing forwards and bend your elbow. If you find this easy, you could do the exercise holding a tin of food or water bottle or a weight to make it more difficult.

- **Arm Raises**
  - Stand or sit in a chair.
  - Lift both arms together, up above your head and then out in front of you. If you find this easy, you could do the exercise holding a tin of food or water bottle to make it more difficult.

- **Sit to stand from a chair**
  - Put your arms across your chest, stand up from the chair and then sit down again slowly. If you feel too unsteady doing this, then don’t cross your arms and lightly use your arms to push up.

- **Mini Squats**
  - In standing, hold onto the back of a chair or firm surface. Keep your feet hip width apart, slowly bend your knees as far as you feel comfortable, keeping you back as straight as possible. Hold for 2 seconds and then straighten your knees, squeeze your bottom muscles and thigh muscles as you do.

- **Marching on the spot**
  - Whilst standing is best, but you can complete this in sitting if you feel unsteady. March on the spot for 30 seconds, rest for 30 seconds. If you find this easy, bring your knees up higher while you’re marching.

 Aim to repeat this 5 times on each arm
 Aim to repeat this 5 times
 Aim to repeat this 5 times
 Aim to repeat this 5 times

---

Once you are able to manage these exercises more easily, then you could gradually increase the number of times the time you spend doing each of the exercises.

Please consult a healthcare professional involved in your care if you have any concerns reporting activities or exercises on this website. When undergoing chemotherapy, radiotherapy, surgery or any other treatment for cancer, you may be given specific advice on which activities you may or may not do when undergoing your treatment, and it is important to follow this advice.
Launched April 2019….

- Nearly 2000 patients referred in 2 years (Year 1 April 19 to Feb 20 – 975, Year 2 March 20 to April 21 – 821)
- Referrals received from all 10 GM Hospitals
- **80% participation rate** (increased during C19)
- 94% uptake rate from initial assessment
- **100% patients accessing service local to their residential postcode**
- Over 1000 people accessed remote service model since pandemic started (March 2020)
- **75% participants access ‘Rehab’ phase of service model**
Prehab4Cancer participants (by age)

Age SHOULD NOT be a BARRIER to exercise...

Age Breakdown

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of referrals</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29</td>
<td>3</td>
</tr>
<tr>
<td>30-39</td>
<td>15</td>
</tr>
<tr>
<td>40-49</td>
<td>72</td>
</tr>
<tr>
<td>50-59</td>
<td>233</td>
</tr>
<tr>
<td>60-69</td>
<td>542</td>
</tr>
<tr>
<td>70-79</td>
<td>630</td>
</tr>
<tr>
<td>80-89</td>
<td>181</td>
</tr>
<tr>
<td>90+</td>
<td>2</td>
</tr>
<tr>
<td>GM Patient level data average (mean)</td>
<td>Baseline</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Physiological assessments</strong></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>77.5</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>27.2</td>
</tr>
<tr>
<td>Sit to Stand (reps/min)</td>
<td>19</td>
</tr>
<tr>
<td>6MWT (m)</td>
<td>321.7</td>
</tr>
<tr>
<td>ISWT (m)</td>
<td>384.9</td>
</tr>
<tr>
<td><strong>Survey assessments</strong></td>
<td></td>
</tr>
<tr>
<td>WHODAS</td>
<td>6</td>
</tr>
<tr>
<td>Self-efficacy scale for exercise</td>
<td>61.8</td>
</tr>
</tbody>
</table>

***FURTHER STATISTICAL DATA ANALYSIS TO BE COMPLETED***
Physiological assessments (walk tests) LUNG

Six Minute Walk Test (6MWT) – frail, older patients or those contraindicated for the ISWT.

Incremental Shuttle Walk Test (ISWT) – standard ax. within lung pathway, bleep test
Hosted by Salford

GM PARTNERSHIP

DSCRO DATA SERVICES FOR COMMISSIONERS

HISTORICAL

PREHAB OUTCOME DATA

‘LIVE DATA’

SUS SECONDARY USES SERVICE

LEGACY COHORTS

COMMISSIONING B.I.

Demonstrate that Prehab adds value to GM Healthcare
Reduce 30 and 90 hospital costs – less complications
Reduce the cost of supporting patients
Better Functional recovery and QOL – learn from our cohorts of patients
Improve 2 year survival

Hosted by

SUS SECONDARY USES SERVICE

LEGACY COHORTS

COMMISSIONING B.I.
How do patients undergoing surgery for cancer perceive the GM Cancer Prehab4Cancer and Recovery programme? **Single, semi-structured interviews conducted by telephone call with cancer patients referred into the Prehab4Cancer service – participants & non-participants.** Thematic Analysis – Framework approach (Ritchie & Spencer, 1994)

How do health professionals involved in referring patients to the GM Cancer Prehab4Cancer and Recovery programme perceive the programme? **Anonymous, web-based survey containing open-ended questions.**

**Initial salient findings:**
- Transport ALWAYS a major consideration of acceptability
- Psychosocial support KEY: regular contact from P4C team throughout cancer pathway, more so than clinical teams particularly during pandemic
- Prehabilitation ACCEPTABLE.
- Need to target non P4C participants and patients from lower SES areas, as well as P4C team members for further study
Frailty and engaging older people has been a key consideration in our service co-design and co-delivery: Specialist (AHPs/Ex. Physiology/SEM/Psychology) team needed to provide assessments and interventions to people with complex co-morbidities, complex needs & contraindications to engaging in current community-based service provision SAFELY

- DIGITAL: understanding how lessons learnt during COVID can support whole population delivery of Prehab4Cancer
- Research: understanding the mechanisms of prehab/rehab delivery & most effective interventions for optimal clinical & QoL outcomes.
- Service Development: Workforce, Costing, Blended remote service model...
- Extensions to eligibility criteria to include other site-specific tumour pathways.
ACKNOWLEDGEMENTS
"I was told we’re going to get you fitter to get you out of hospital quicker, that was all the motivation I needed"

"Mentally it has done us really well. It gets you out of the house. Seeing the same people in the group was good for me"

"I see this as part of my treatment"

"Getting the phone call from the trainer was important as I had enough appointments to go to"

"I didn’t need any convincing to go once I’d been told about how it would impact my treatment and recovery"

"There was a positive impact on my post op complications"

"It was important the health centre was near to where I live"

"When I first went I thought, what the bloody hell am I doing here, I must be mad"

"Gym can feel intimidating so went as a group the first time"

"Having a diagnosis of a life threatening illness made me feel I had to do it"

"Surgeons said I had to get fitter and put weight on or I would be dead, so it was a no brainer!"

"Do it – don’t be frightened"

"How did you feel it went, what did you enjoy, was it better or worse than you expected, were you surprised and was there anything you didn’t like?"

"I’ve been feeling really low I can concentrate on my wellbeing at the gym – made me feel better about myself"

"I’m in a better position for treatment"

"It was great that there were 3 different gyms available for me to use"

"The gym gave me a focus and I felt in control"

"Do it at your own pace"

"Tailoring the program to my needs important – giving me home exercises"

"I had no doubts about taking part, the trainer knew her stuff"

"People in hospital at the same time as me who’d not been through the programme struggled to get out of bed"

"The advice was well balanced, including ‘don’t do too much!’"

"If you weren’t offered prehab would you have gone to the gym?"

"I was very weak after the op – the trainer took it slowly"

"I’m better able to cope with cancer and the treatment"

"One person responded yes, the rest said no!"

"Prehab helped me to leave hospital early"

"I was better able to have the op – it was easier than I thought"

"I had to lose weight or they wouldn’t give the operation"
Presentation 3: Preoperative exercise training for patients with non-small cell lung cancer

A/Prof Catherine Granger, PhD, PT, FACP

The University of Melbourne & Royal Melbourne Hospital, Australia
Lung cancer is associated with significant morbidity

Lung cancer is associated with significant morbidity\textsuperscript{1}

**6 Minute Walk Test**

<table>
<thead>
<tr>
<th></th>
<th>Mean (SE) 6MWD (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment</td>
<td>407</td>
</tr>
<tr>
<td>10 weeks</td>
<td>365</td>
</tr>
<tr>
<td>6 months</td>
<td>329</td>
</tr>
</tbody>
</table>

Mean difference over 6 months = 78m (95% CI 144–11)

**Quadriceps muscle strength (kilograms)**

<table>
<thead>
<tr>
<th></th>
<th>Mean (SE) Quads strength (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment</td>
<td>18.3</td>
</tr>
<tr>
<td>10 weeks</td>
<td>15.5</td>
</tr>
<tr>
<td>6 months</td>
<td>14.4</td>
</tr>
</tbody>
</table>

Healthy mean (SD) 23.7kg (1.2)

Decline over 6m p < 0.001

\textsuperscript{1} Granger et al. *Lung Cancer* 2014
Lung cancer is associated with significant morbidity\(^1\)

3 out of 5 people with lung cancer do not meet physical activity guidelines\(^1\)

\(^1\) Granger et al. *Lung Cancer* 2014; \(^2\) Edbrooke, Granger et al. *J Clinical Med* 2019; \(^3\) Cavalheri & Granger. *Respirology* 2020
Lung cancer is associated with significant morbidity\(^1\)

3 out of 5 people with lung cancer do not meet physical activity guidelines\(^1\)

Meet PA guidelines
- ↓40% @ diagnosis
- ↓26% @ 10 weeks
- ↓31% @ 6 months

Inoperable LC\(^2\)
- 25% sufficient PA @ diagnosis
- 3,027 steps/day
- 1.6 x bouts of walking > 10min

\(^1\) Granger et al. *Lung Cancer* 2014; \(^2\) Edbrooke, Granger et al. *J Clinical Med* 2019;
Lung cancer is associated with significant morbidity\textsuperscript{1}

3 out of 5 people with lung cancer do not meet physical activity guidelines\textsuperscript{1}

Physical activity and exercise is effective at improving physical and psychological outcomes\textsuperscript{3}

\textsuperscript{1} Granger et al. *Lung Cancer* 2014; \textsuperscript{2} Edbrooke, Granger et al. *J Clinical Med* 2019; \textsuperscript{3} Cavalheri & Granger. *Respirology* 2020
Lung cancer is associated with significant morbidity

3 out of 5 people with lung cancer do not meet physical activity guidelines

Physical activity and exercise is effective at improving physical and psychological outcomes

Programs for lung cancer are infrequent world-wide

Potential Exercise Training Timepoints in Lung Cancer

- **Diagnosis**
  - Pre-treatment
- **Surgery**
  - Post surgery
- **Chemo/Radio**
  - During treatment
- **Survivorship**
  - After treatment
- **Metastatic Dx**
  - Advanced disease
Pre-operative exercise training in lung cancer

Diagnosis  Surgery  Post-op recovery

Opportunistic waiting time
Pre-operative exercise training in lung cancer

Exercise capacity

Diagnosis  Surgery  Post-op recovery

Usual care
Pre-operative exercise training in lung cancer

Exercise capacity

Diagnosis

Surgery

Post-op recovery

Identify and target impairments\(^1\)\(^-\)\(^2\)

Improve health, \(\downarrow\) incidence & severity of current and future impairment\(^1\)\(^-\)\(^2\)

Rational of pre-operative exercise in lung cancer

• Functional exercise capacity = Independent predictor of post-operative pulmonary complications (PPC)\(^1\)-\(^2\)
• VO\(_{2\text{peak}}\) < 15ml/kg/min = Increased risk PPC
• VO\(_{2\text{peak}}\) < 60% predicted = worse long term survival\(^3\)

Rational of pre-operative exercise in lung cancer

• Functional exercise capacity = Independent predictor of post-operative pulmonary complications (PPC)¹⁻²

• VO₂peak < 15ml/kg/min  = Increased risk PPC

• VO₂peak < 60% predicted = worse long term survival³

• PPCs = increase ICU admissions, length of stay, re-admissions, early and late mortality⁴⁻⁵

Rational of pre-operative exercise in lung cancer

- Functional exercise capacity = Independent predictor of post-operative pulmonary complications (PPC)\textsuperscript{1-2}
- \(\text{VO}_{2\text{peak}} < 15\text{ml/kg/min} = \text{Increased risk PPC}\)
- \(\text{VO}_{2\text{peak}} < 60\% \text{ predicted} = \text{worse long term survival}\textsuperscript{3}
- PPCs = increase ICU admissions, length of stay, re-admissions, early and late mortality\textsuperscript{4-5}

› Preoperative exercise training:
- Potential improvement in \(\text{VO}_{2\text{peak}}\)
- ? Improvements in PPC and other postoperative outcomes

\textsuperscript{1} ERS/ESTS guidelines 2009; \textsuperscript{2} ACCP guidelines 2013; \textsuperscript{3} Lindenmann et al. Cancers 2020; \textsuperscript{4} Lugg et al. Thorax 2016; \textsuperscript{5} Kaufmann et al. Acta Anaesthesiol Scand 2019
Preoperative exercise training for patients with non-small cell lung cancer (Review)

Cavalheri V, Granger C


Update in progress during 2021
Pre-operative exercise and lung cancer - publications

Preliminary medline search
December 2020

Showing 476 records for #3 AND #2 AND #1
Effects of perioperative exercise interventions on lung cancer patients: An overview of systematic reviews

Weliyao Zhou PhD student, MSN • Seoyoon Woo PhD, RN • Janet L. Larson PhD, RN, FAAN

Supportive Care in Cancer (2021) 29:445–457
https://doi.org/10.1007/s00520-020-05499-6

Systematic Review and Meta-Analysis of Randomized, Controlled Trials on Preoperative Physical Exercise Interventions in Patients with Non-Small-Cell Lung Cancer

Ilem D. Rosero 1, Robinson Ramirez-Velez 1, Alejandro Lucia 2,3,4, Nicolas Martinez-Velilla 1,4, Alejandro Santos-Lozano 2,4, Pedro L. Valenzuela 6, Idoia Morilla 3 and Mikel Izquierdo 1,4,5,6

Cancers 2019, 11, 944; doi:10.3390/cancers11070944
Pre-operative exercise trials in lung cancer

- $n = 15$ RCTs$^{1-2}$
- Sample sizes range from $n = 19 – 151$
- Commonly conducted in United States, China or Europe

$^1$ Rosero et al. *Cancers* 2019; $^2$ Himbert et al. *Critical Reviews in Oncology / Hematology* 2020
Pre-operative exercise programs:

• **Length**: 5 days to 8 weeks
• **Setting**: supervised, in/outpatients (most inpatient supervised)
• **Type**: Individual or group
• **Frequency**: 3x daily to 5x weekly
• **Duration**: 30 to 45 minutes

1 Rosero et al. Cancers 2019; 2 Himbert et al. Critical Reviews in Oncology / Hematology 2020
Pre-operative exercise programs:

- **Length:** 5 days to 8 weeks
- **Setting:** supervised, in/outpatients (most inpatient supervised)
- **Type:** Individual or group
- **Frequency:** 3x daily to 5x weekly
- **Duration:** 30 to 45 minutes

- **Training:**
  - Aerobic exercise (walking +/- stationary cycling)**
  - Resistance training
  - +/- inspiratory muscle training
- **Intensity:** mod to high (50 to 80% Wmax / 80 to 100% Wmax)

---

1 Rosero et al. *Cancers* 2019; 2 Himbert et al. *Critical Reviews in Oncology / Hematology* 2020
Outcomes: $\uparrow$ exercise capacity post-program

6 minute walk test

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>SMD [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huang, 2017</td>
<td>0.30 [0.13, 0.73]</td>
</tr>
<tr>
<td>Lai, 2017</td>
<td>0.16 [-0.27, 0.59]</td>
</tr>
<tr>
<td>Lai, 2017</td>
<td>0.17 [-0.16, 0.50]</td>
</tr>
<tr>
<td>Licker, 2017</td>
<td>0.40 [0.13, 0.68]</td>
</tr>
<tr>
<td>Morano, 2014</td>
<td>0.19 [-0.70, 1.09]</td>
</tr>
<tr>
<td>Sebio, 2017</td>
<td>0.13 [-0.58, 0.84]</td>
</tr>
<tr>
<td>RE Model ($I^2 = 0.0%$)</td>
<td>0.27 [0.11, 0.44]</td>
</tr>
</tbody>
</table>

$\uparrow$ indicates an increase.

VO$_2$ peak

<table>
<thead>
<tr>
<th>Author(s) and Year</th>
<th>SMD [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karenovics, 2017</td>
<td>0.43 [0.16, 0.70]</td>
</tr>
<tr>
<td>Licker, 2017</td>
<td>0.76 [0.48, 1.05]</td>
</tr>
<tr>
<td>Stefanelli, 2013</td>
<td>1.42 [0.77, 2.06]</td>
</tr>
<tr>
<td>RE Model ($I^2 = 76.7%$)</td>
<td>0.78 [0.35, 1.21]</td>
</tr>
</tbody>
</table>

$\uparrow$ indicates an increase.

$^1$ Rosero et al. *Cancers* 2019
Outcomes: ↓ dyspnoea post-program

1 Rosero et al. Cancers 2019
Outcomes: ↓ pulmonary complications & length of stay after surgery

Post op pulmonary complications

Hospital length of stay

\[ \text{Author(s) and Year} \]

<table>
<thead>
<tr>
<th>SMD [95% CI]</th>
<th>RE Model (I^2 = 0.0%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huang, 2017</td>
<td>-0.35 [-0.78, 0.08]</td>
</tr>
<tr>
<td>Lai, 2017</td>
<td>-0.44 [-0.87, -0.01]</td>
</tr>
<tr>
<td>Lai, 2017</td>
<td>-0.24 [-0.57, 0.09]</td>
</tr>
<tr>
<td>Stefanelli, 2013</td>
<td>-0.19 [-0.72, 0.34]</td>
</tr>
</tbody>
</table>

\[ \text{Relative Risk [95% CI]} \]

<table>
<thead>
<tr>
<th>Relative Risk [95% CI]</th>
<th>RE Model (I^2 = 0.0%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo, 2011</td>
<td>0.18 [0.03, 1.22]</td>
</tr>
<tr>
<td>Huang, 2017</td>
<td>0.57 [0.19, 1.75]</td>
</tr>
<tr>
<td>Karenovics, 2017</td>
<td>0.52 [0.32, 0.85]</td>
</tr>
<tr>
<td>Lai, 2016</td>
<td>0.40 [0.09, 1.86]</td>
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<tr>
<td>Lai, 2017</td>
<td>0.36 [0.13, 1.01]</td>
</tr>
<tr>
<td>Lai, 2017</td>
<td>0.35 [0.14, 0.90]</td>
</tr>
<tr>
<td>Licker, 2017</td>
<td>0.52 [0.32, 0.85]</td>
</tr>
<tr>
<td>Sebio, 2017</td>
<td>0.75 [0.36, 1.57]</td>
</tr>
</tbody>
</table>

1 Rosero et al. Cancers 2019
Long term outcomes are unclear

1 year follow-up

→ No difference between groups for survival, respiratory function or exercise capacity

→ Both groups had similar decline in:
  → $\text{VO}_2\text{peak} = \text{mean 12\% (95\% CI 5 to 18)}$
  → Peak work rate = mean 11\% (95\% CI 4 to 17)

1 Karenovics et al. *Eur J Cardiothorac Surg* 2017
Cost effectiveness is unclear

- ↓ hospital LOS median 5 [IQR 4-7] days
- ↓ total, drug and material costs
- Total costs approx. median intervention $US 7,438 vs control $US 8,028

n = 68
Primary outcome = change in 6min walk post-program

• n = 158
• Primary outcome = change in hospital length of stay
• Prehab = exercise, nutrition, ↓ smoking and CBT
• Status = recruiting, expected completion June 2021

1 Barberan-Garcia et al. BMC Health Services Research 2020
Optimal exercise training regime is unclear, but most programs include aerobic exercise (to target VO$_2$peak) – this appears to be essential.

From individual trials:

1. IMT alone may be effective at ↑ respiratory function & ↓ complications (small study with limitations)

2. Aerobic exercise in combination with IMT is superior to IMT

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Future research questions:

**Question 1:** What is the cost-effectiveness of: (i) preoperative exercise training? (ii) post-operative exercise training? and (iii) exercise training during treatment for advanced/inoperable lung cancer?

**Question 2:** In people undergoing treatment for lung cancer, is exercise training delivered via a mobile phone application or telerehabilitation as effective as outpatient supervised exercise training programmes to improve health outcomes?

**Question 3:** What is the optimal length for exercise training programmes across all stages of disease?
Summary

Pre-operative exercise training for lung cancer in 2021
Pre-operative exercise training for lung cancer in 2021

Summary

Safe and acceptable

? Feasible
Summary

Safe and acceptable

? Feasible

↑ Exercise capacity
↓ Dyspnoea
↓ PPC rate
↓ Hospital length of stay

Pre-operative exercise training for lung cancer in 2021
Pre-operative exercise training for lung cancer in 2021

Safe and acceptable

? Feasible

↑ Exercise capacity
↓ Dyspnoea
↓ PPC rate
↓ Hospital length of stay

Small sample sizes
Low quality
Need long-term outcomes
Need cost effectiveness
Pre-operative exercise training for lung cancer in 2021

- Safe and acceptable
- ? Feasible
- Exercise capacity ↑
- Dyspnoea ↓
- PPC rate ↓
- Hospital length of stay ↓
- Small sample sizes
- Low quality
- Need long-term outcomes
- Need cost effectiveness
- Be considered for patients awaiting surgery
- Surgery should not be delayed
- Need more research
1. Granger C., McDonald C. et al., Low physical activity levels and functional decline in individuals with lung cancer Lung Cancer (2014) 83(2)
5. Silver J. and Baima J., Cancer prehabilitation: an opportunity to decrease treatment-related morbidity, increase cancer treatment options, and improve physical and psychological health outcomes Am J Phys Med Rehabil (2013) 92(8)
Thank you

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