Prehabilitation: Optimizing Patients to Improve Outcomes - Pt. 1

May 19, 2021

IASLC
INTERNATIONAL ASSOCIATION FOR THE STUDY OF LUNG CANCER
Conquering Thoracic Cancers Worldwide

CME ACCREDITED

Prehabilitation: Optimizing Patients to Improve Outcomes

Presenters:

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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

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My mission today:

Convince you that our patients need to exercise

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1/3 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*

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1/3 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]

Usual care does not normally include exercise training or pulmonary rehabilitation[3-4]

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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%

Emaus A, Thune I. Physical activity and lung cancer prevention. Recent Results Cancer Res. 2011; 186:101–133.

Physical activity and lung cancer risk

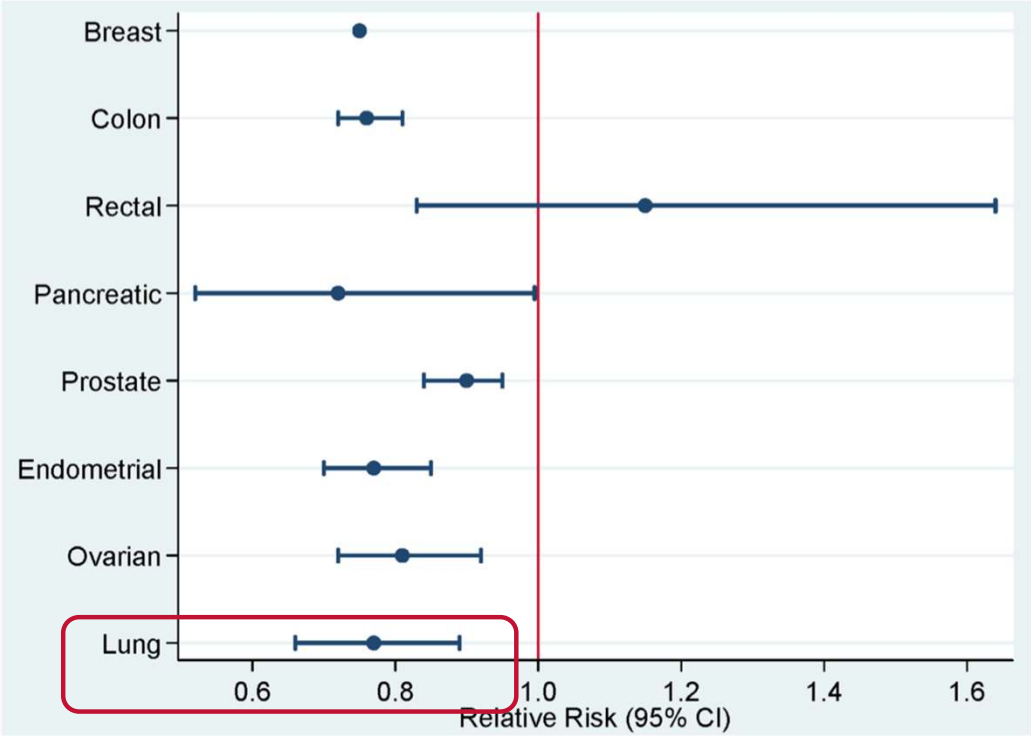
Risk reduction, meta-analysis of 11 studies comparing highest versus lowest levels of leisure-time physical activity, (adjusting for smoking intensity):

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

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

Tardon A et al. Leisure- time physical activity and lung cancer: a meta-analysis. Cancer Causes Control. 2005; 16(4):389– 397

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



Rundle A. Molecular epidemiology of physical activity and cancer. Cancer Epidemiol Biomarkers Prev. 2005; 14(1):227–236.

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 caner risk

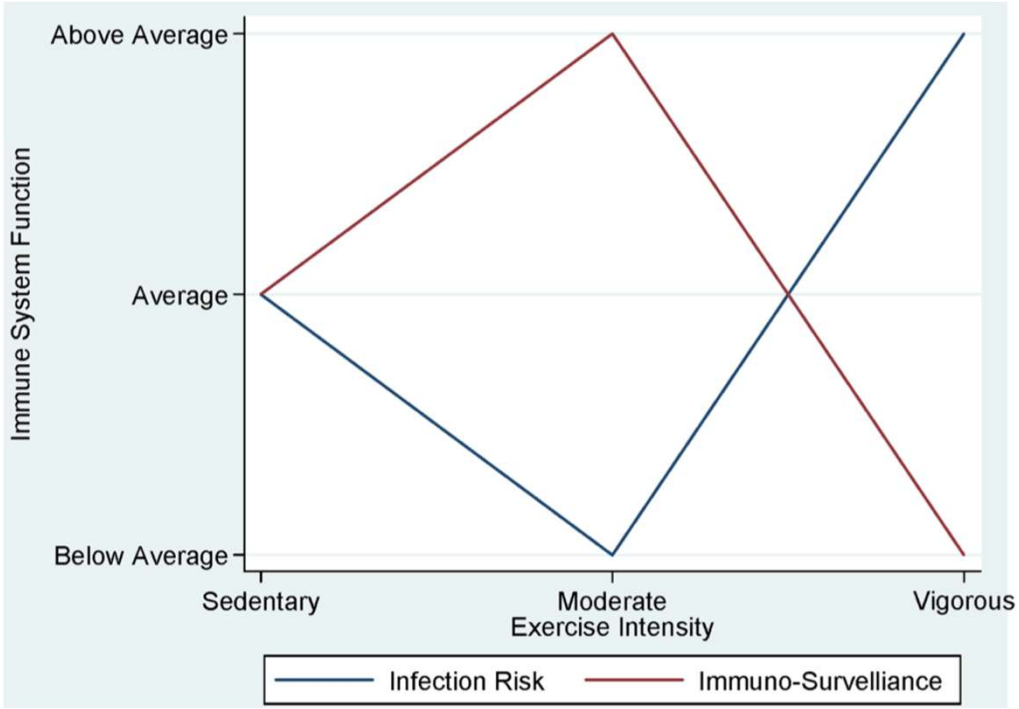
T-Cell populations transiently rise

NK Cell populations and activity transiently rise

Neutrophil quantity and activity also transiently rise

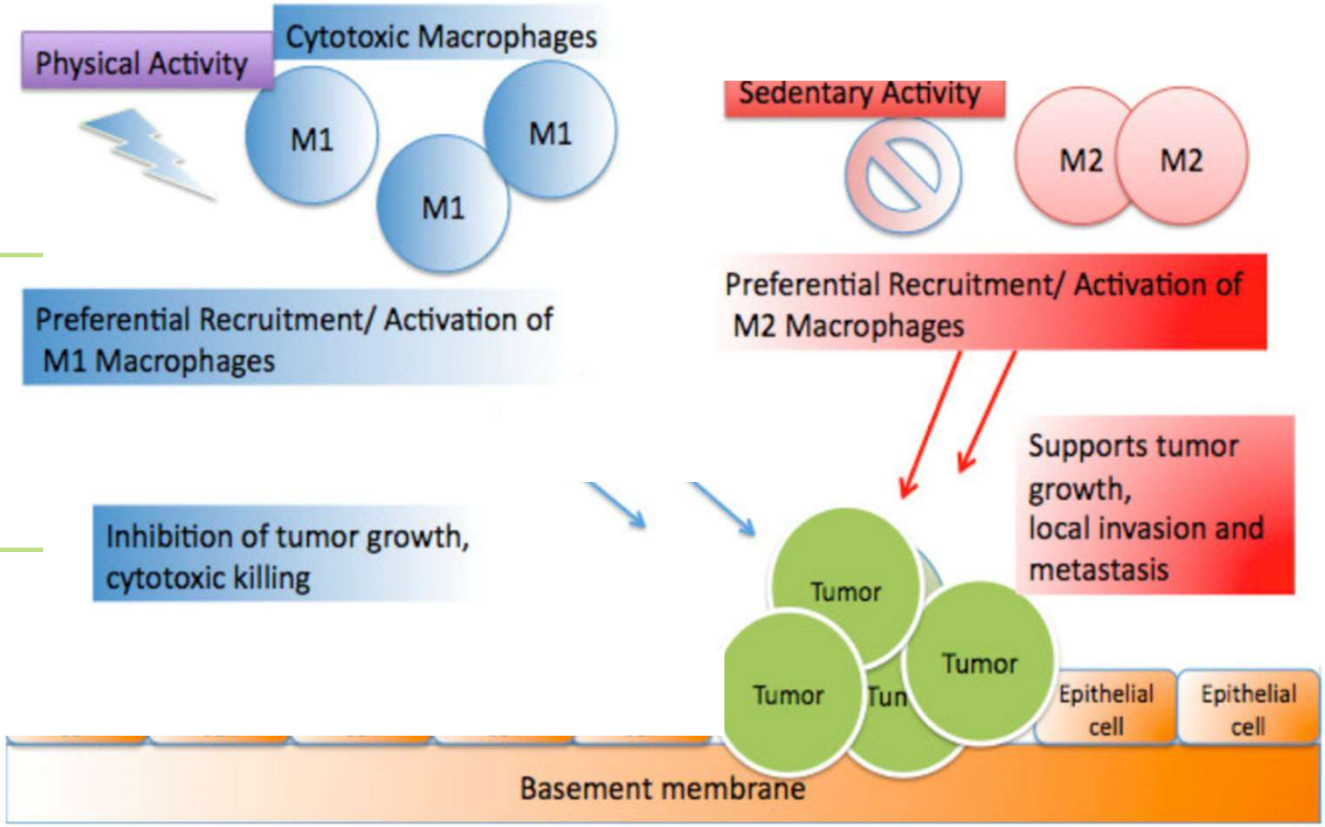
hard R J. Effects of exercise and training on natural killer cell counts and cytolytic activity: a meta-analysis. Sports Med. 1999; 28(3):177-195

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



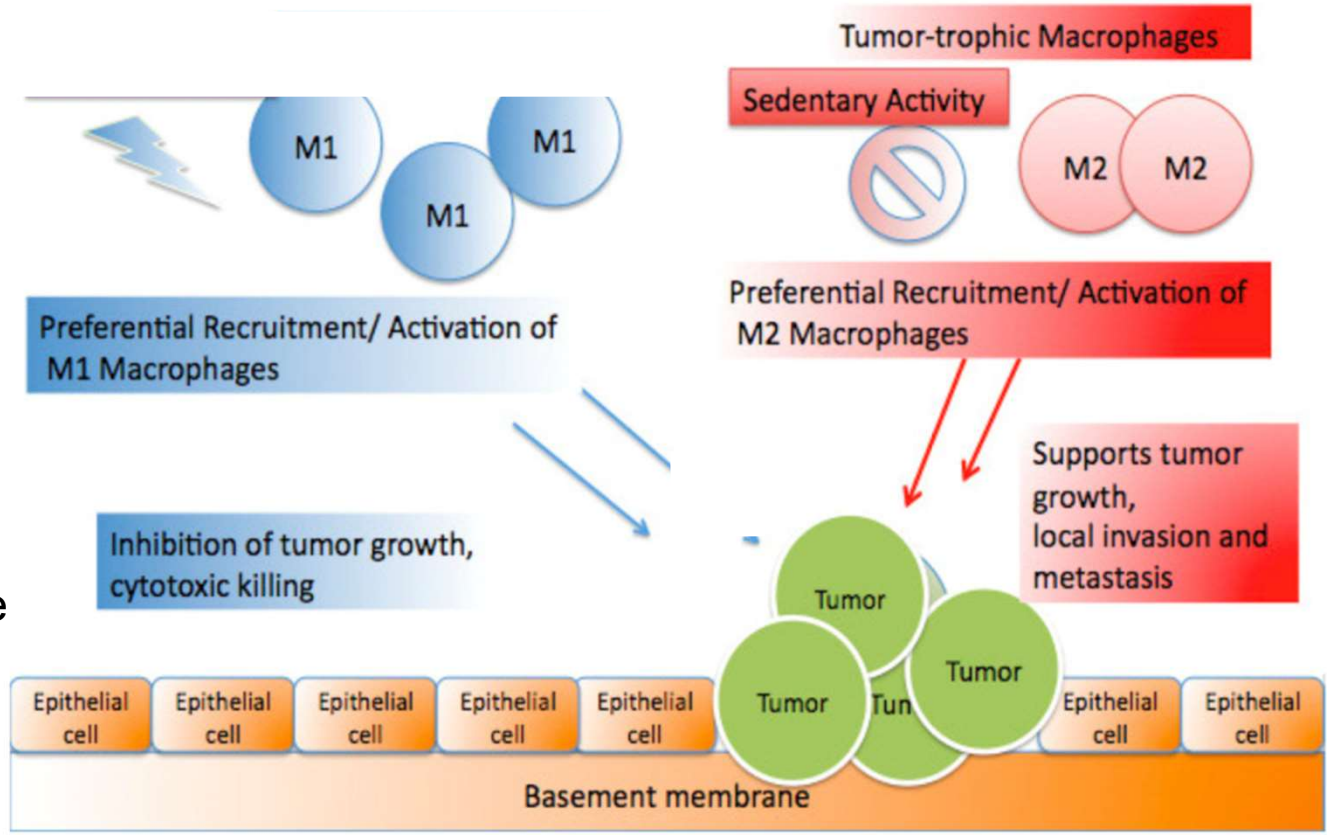
Proposed role of physical activity and exercise on polarization of macrophages in tumor microenvironment:

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



Kizaki T et al. Adaptation of macrophages to exercise training improves innate immunity. Biochem Biophys Res Commun 372: 152-156, 2008

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



Kizaki T et al. Adaptation of macrophages to exercise training improves innate immunity. Biochem Biophys Res Commun 372: 152-156, 2008

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

Lung Cancer Incidence

10%
47%
65%

Lung Cancer Mortality

13%
58%
76%

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?

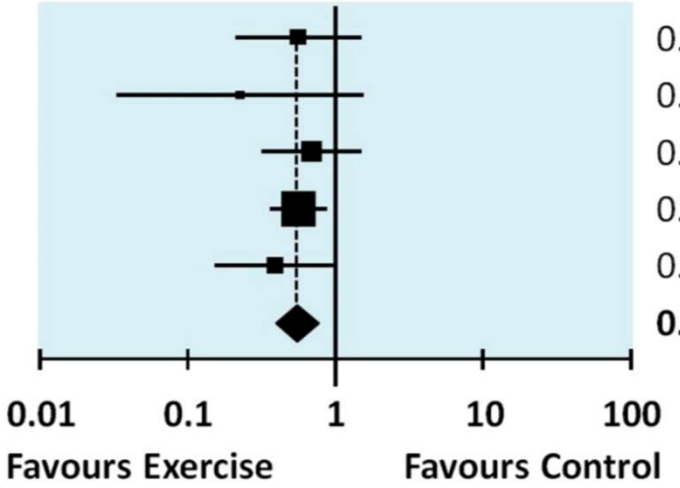
Prevent Cancer

Improve symptom management

Improve surgical outcomes

Preoperative exercise halves the postoperative complication rate in patients with lung cancer: a systematic review of the effect of exercise on complications, length of stay and quality of life in patients with cancer

Author, year	Number of events / Total: Pre-op Exercise	Control	RR (95%CI)	Weight (%)
Lung Cancer				
Benzo, 2011	3 / 9	5 / 8	0.53 (0.18 to 1.55)	12
Pehlivan, 2011	1 / 30	5 / 30	0.20 (0.02 to 1.61)	3
Fang, 2013	6 / 22	9 / 22	0.67 (0.29 to 1.56)	18
Licker, 2016	17 / 74	33 / 77	0.54 (0.33 to 0.88)	55
Lai, 2017	4 / 30	11 / 30	0.36 (0.13 to 1.01)	12
Pooled Effect: I^2= 0%			**0.52 (0.36 to 0.74)**	**100**



Steffens D, *et al. Br J Sports Med* 2018

Preoperative exercise halves the postoperative complication rate in patients with lung cancer: a systematic review of the effect of exercise on complications, length of stay and quality of life in patients with cancer

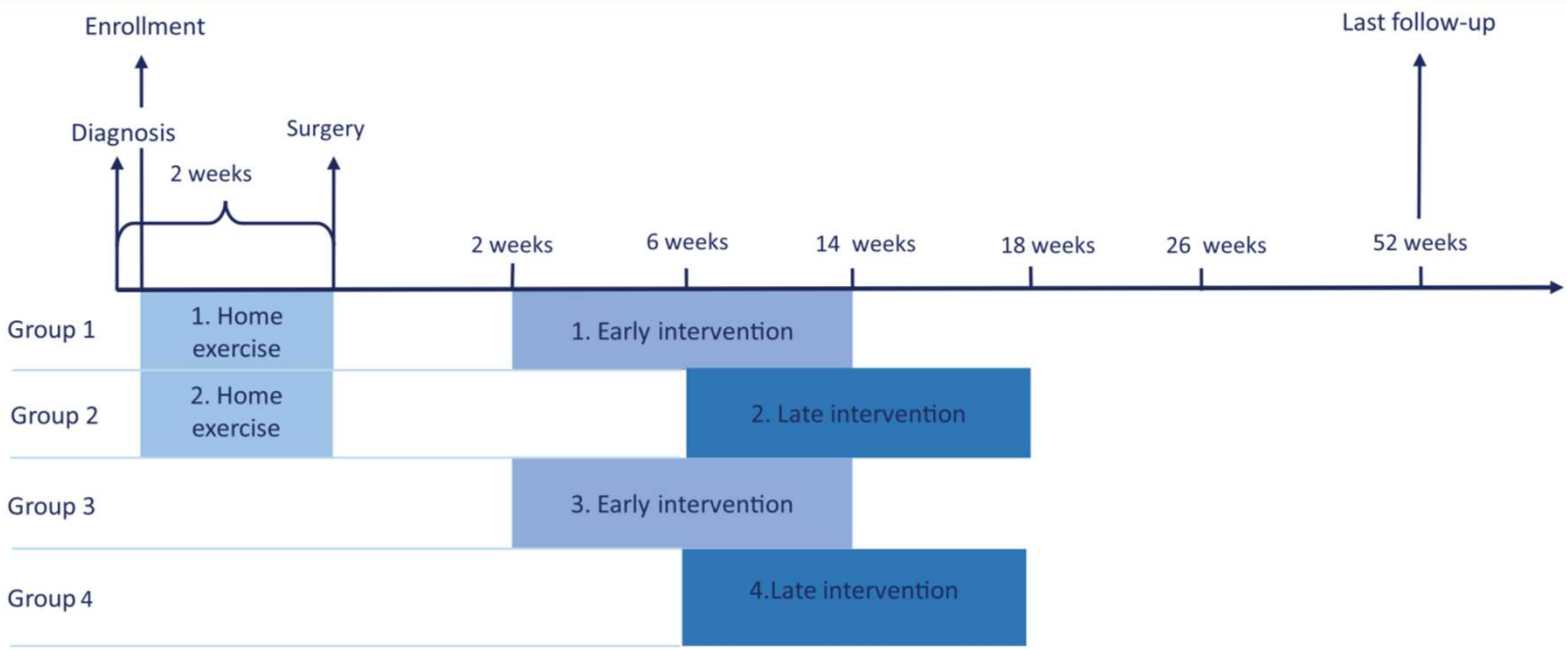
- Preoperative exercise in patients undergoing lung resection, compared with control

Postoperative Complication Rates

Length of Hospital Stay

Steffens D, *et al. Br J Sports Med* 2018

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



Sommer, MS et al. Integrative Cancer Therapies 2016, Vol. 15(4) 455–466

Results: Perioperative Rehabilitation in Operable Lung Cancer

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

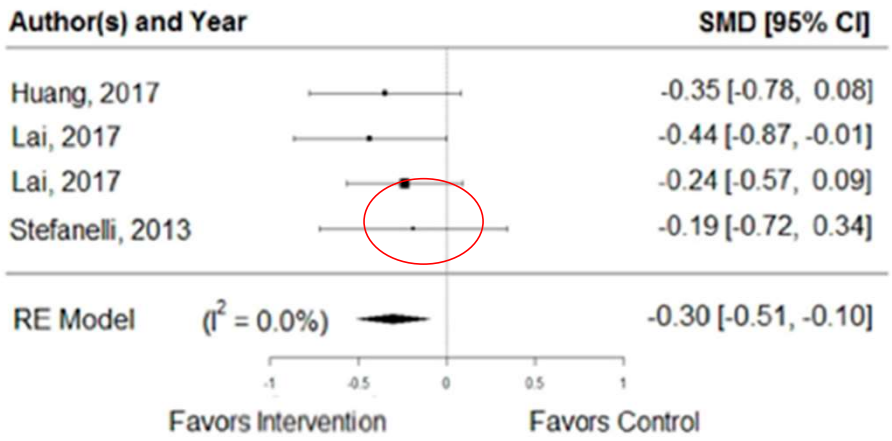
Early initiated postoperative rehabilitation reduces fatigue in patients with operable lung cancer: a randomized trial

- 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

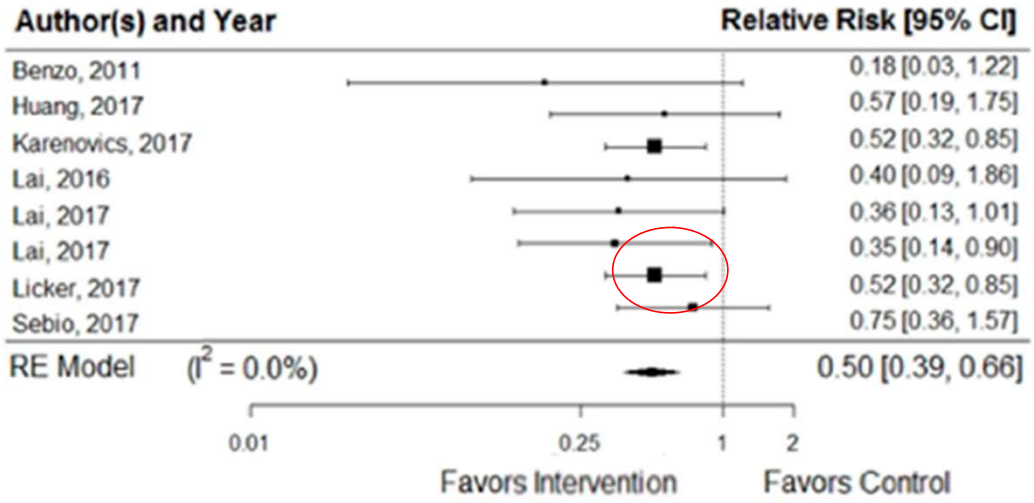
Quist, M.et al.; Lung Cancer Dec 2018

Outcomes: ↓ pulmonary complications & length of stay after surgery

Post op pulmonary complications



Hospital length of stay



Rosero et al. *Cancers* 2019

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

Physiologic System	Normal adaptation to exercise training	Side effects/ symptoms of cancer treatment
Cardiovascular	↑ VO2 max; ↓ resting HR; ↓ BP; ↑ Hb	↓ VO2 max ; ↓ exercise tolerance; ↓ Hb
Respiratory	work of breathing	lung capacity; work of breathing and dyspnea
Musculoeskeletal	or preserve muscle and muscular strength; bone turnover; joint health	Cachexia; muscle strength, endurance, power, bone loss, arthralgia. mylagia
Neurologic	Improve muscle fiber recruitment, improved gait and balance	Peripheral and central neuropathy; cognitive changes; loss of coordination; balance problems
Metabolic	oxidative capacity; weight management	Weight gain; dyslipidemia
Endocrine	insulin sensitivity; cortisol and estrogens	Hyperinsulinemia; diabetes risk
Immune	Promote anti-inflammatory state	IL6, IL10

Brown, et al. *Compr Physiol*. 2012 October ; 2(4): 2775–2809

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Brown, et al. *Compr Physiol*. 2012 October ; 2(4): 2775–2809

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 webminar

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

@prehab4cancer @ZoeMerchantOT

www.prehab4cancer.co.uk Zoe.Merchant@nhs.net

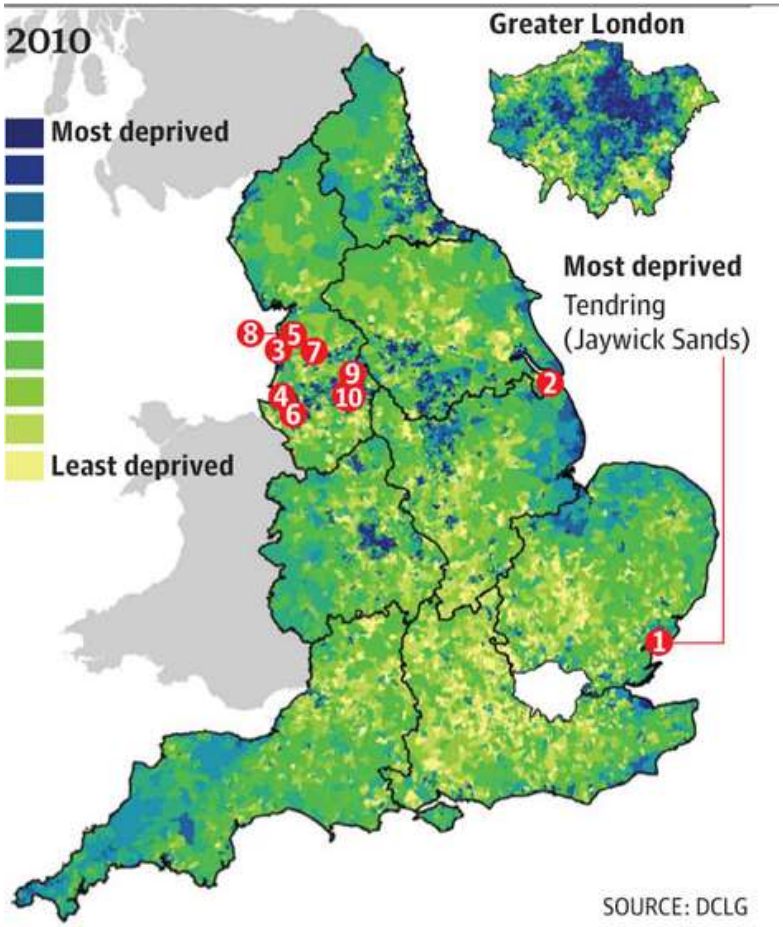
Health Inequalities

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

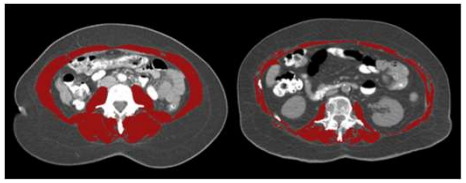
What is Prehabilitation?

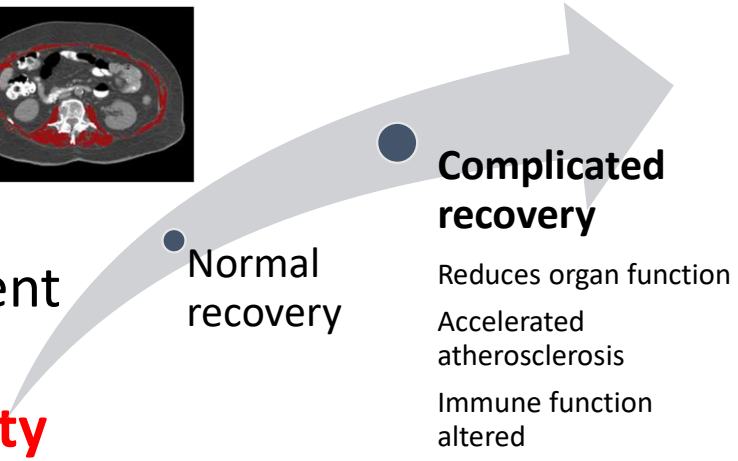
The preparation for the physiological and psychological challenges of cancer treatment.

> ***Prehabilitation and rehabilitation are essential for reducing the future needs of people with cancer.***
>
> ***Independent Cancer Taskforce 2015 5-yr Strategy for cancer***

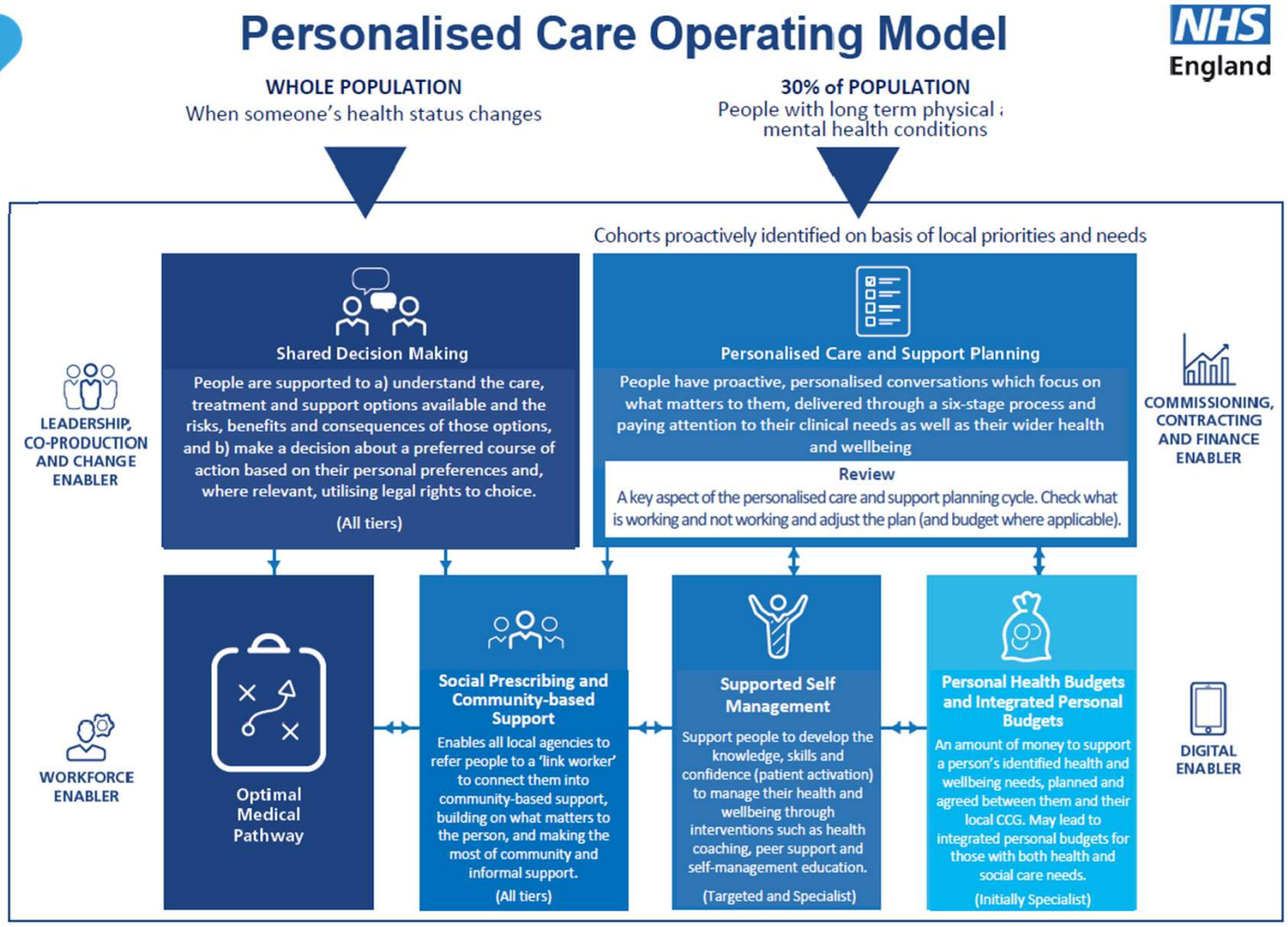
Benefits:

- 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



NHS England (2019) *The NHS Long Term Plan.* London: NHS England.

Springer Link

Published: 24 May 2015

How well are we measuring postoperative “recovery” after abdominal surgery?

Lawrence Lee, Teodora Dumitra, Julio F. Fiore Jr., Nancy E. Mayo & Liane S. Feldman

Quality of Life Research **24**, 2583–2590(2015) | Cite this article

Results

A total of 17 patients and 15 healthcare professionals were interviewed. A total of 22 important recovery-related concepts were identified and linked to the ICF. The four most important concepts were “Energy level,” “Sensation of pain,” “General physical endurance,” and “Carrying out daily routine.” The number of important recovery-related concepts covered

Priorities identified by patients:

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

WHO International Classification of Function, Disability and Health

CA:
A Cancer Journal for Clinicians

Article | Free Access

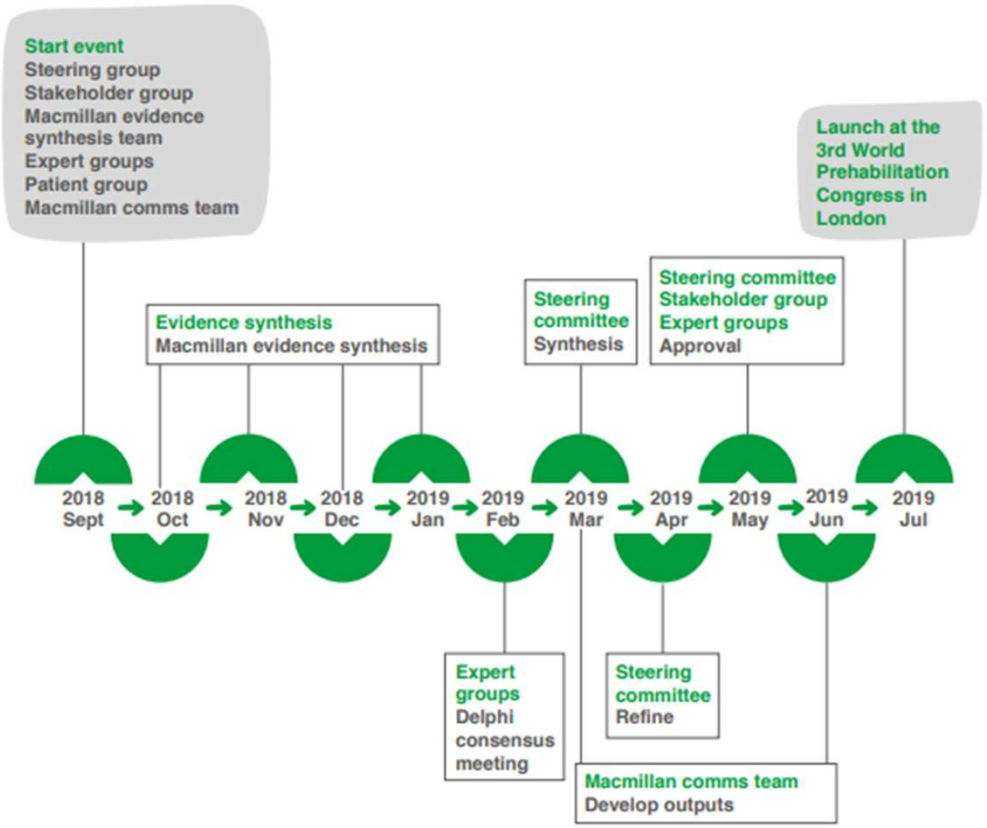
A systematic review of rehabilitation and exercise recommendations in oncology guidelines

Nicole L. Stout DPT, CLT-LANA, Daniel Santa Mina PhD, Kathleen D. Lyons ScD, OTR, Karen Robb PhD, BSc, Julie K. Silver MD

First published: 27 October 2020 | https://doi.org/10.3322/caac.21639 | Citations: 1

* 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

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

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

be defined and used consistently within this framework.

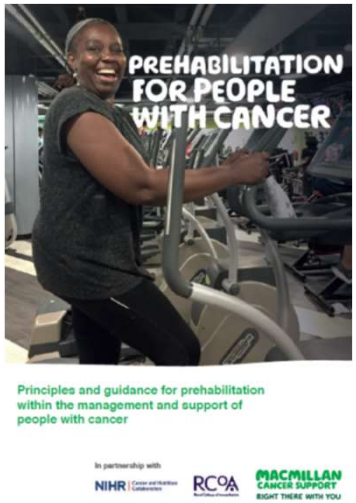
Clinical leadership

18 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 behavioural 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



6. Prehabilitation in the cancer care pathway

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

ii) An example of targeted interventions

Mr Jones

Mr Jones is 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 heartrate monitor chest belt he has been given as a prompt.

Nutrition: Medium risk identified via screening. Instructors notified Mr Jones' referrer who in turn has referred him to be assessed by the oesophagogastric 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 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

PREHAB 4 CANCER GREATER MANCHESTER
Nutrition
Exercise
Wellbeing

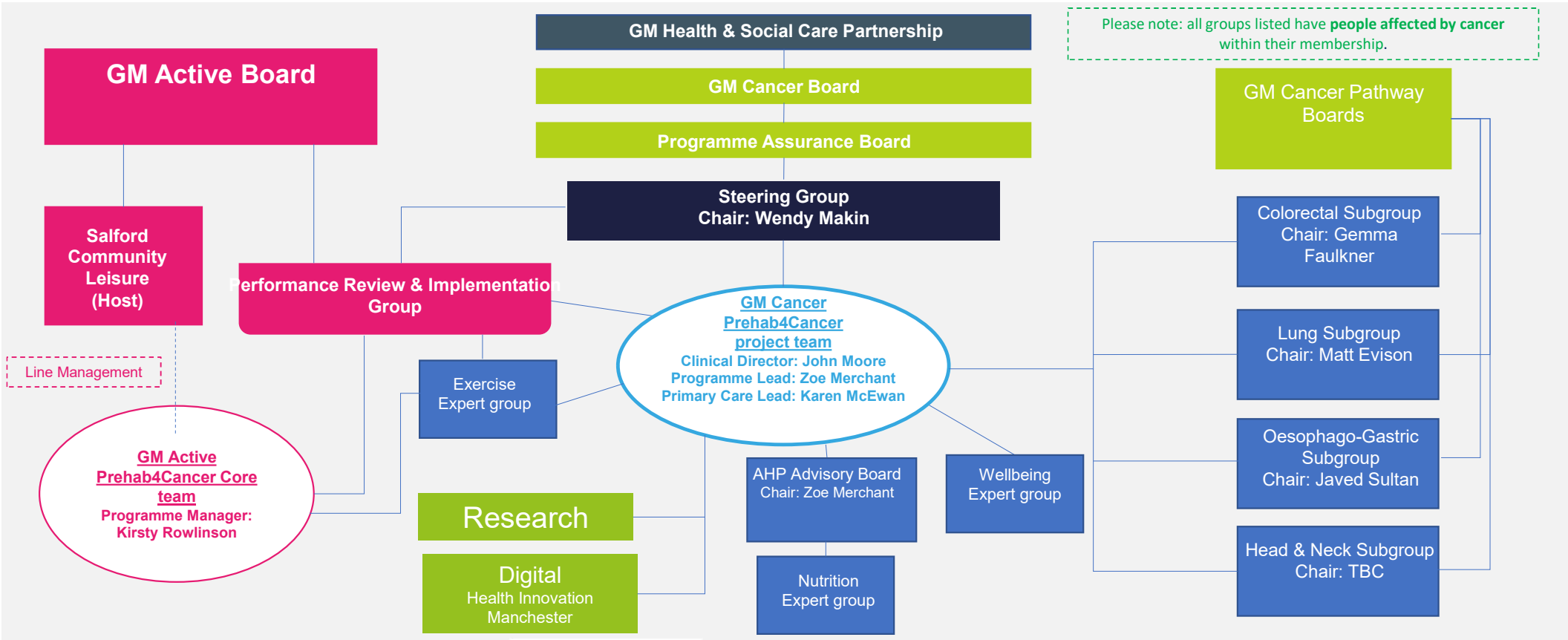
SURGERY SCHOOL

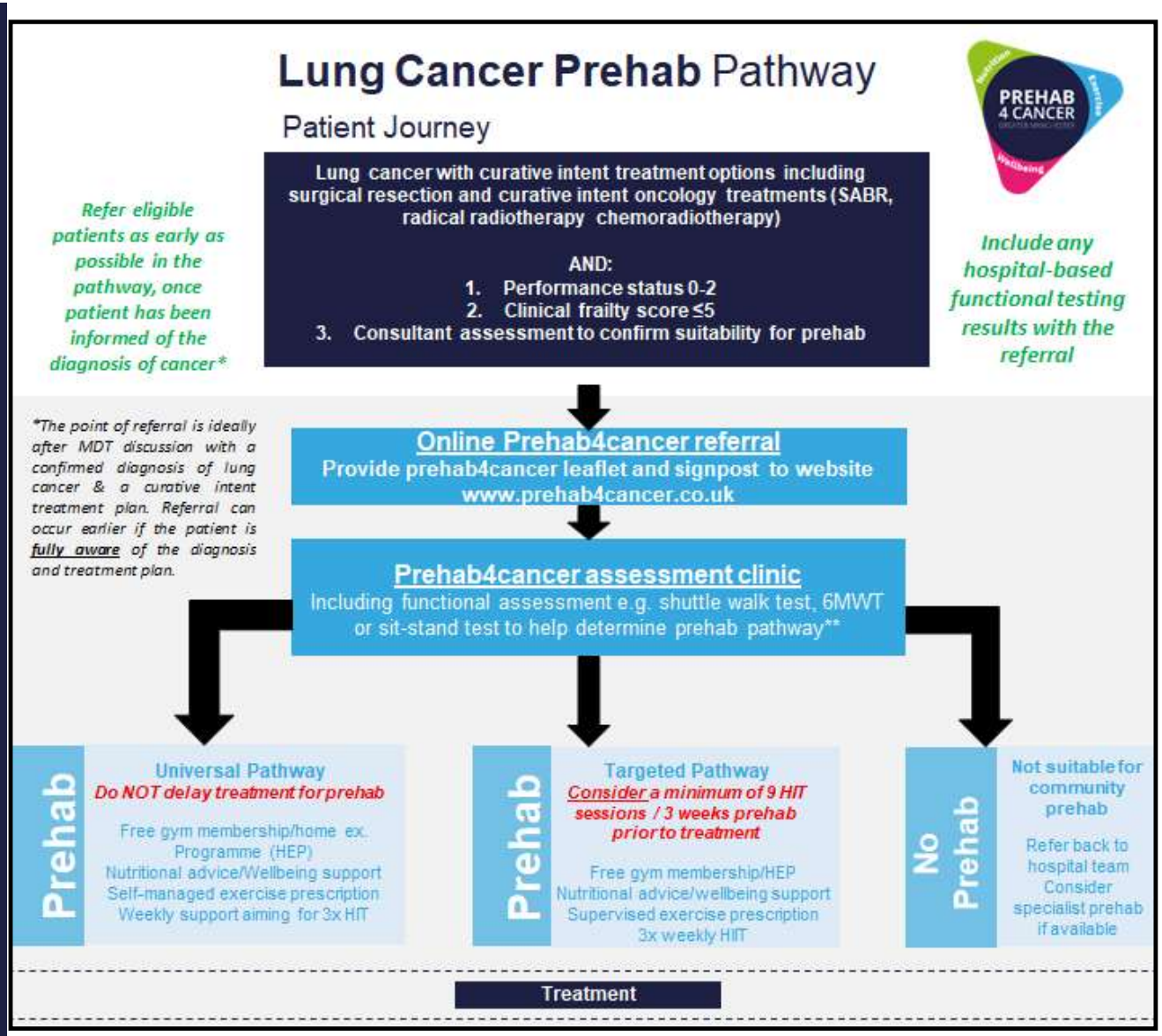
IMPROVING SURGICAL CARE

GM ACTIVE

Greater Manchester Cancer

Governance Structure





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/

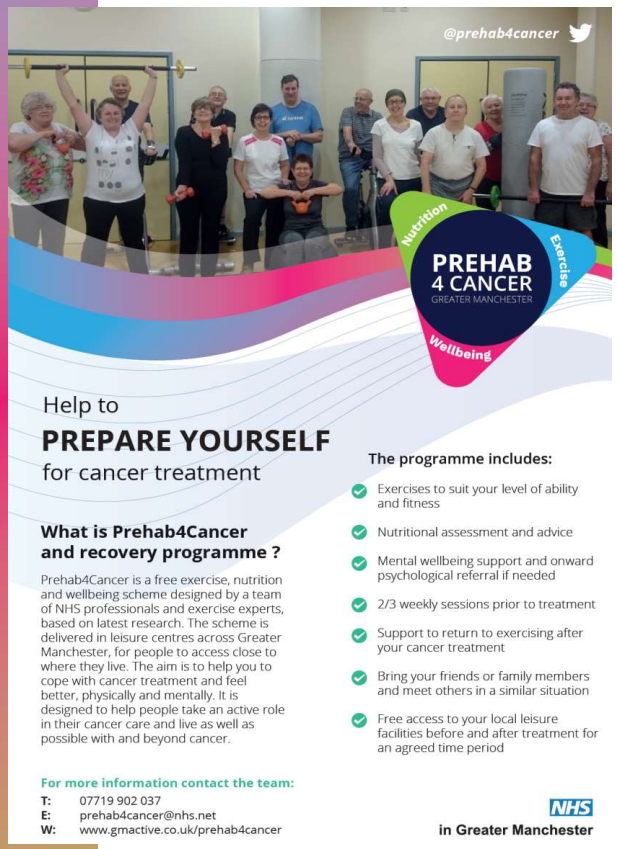

Greater Manchester Health and Social Care Partnership
GMCA GREATER MANCHESTER COMBINED AUTHORITY
Greater Manchester Cancer
Hello!
WELCOME!
Thankyou for coming
We want to gain your thoughts on a prehab and recovery programme for patients diagnosed with cancer
What is Prehab anyway?
Exercise programme before and after surgery, at a gym, with a cancer - trained fitness instructor - to improve surgery outcomes
If you were back at the start... How would you feel about Prehab?
What the evidence shows...
What is important for us to consider?
Exercise improves and addresses fatigue
WEARABLE DATA
At the end of treatment you feel like you drop off a cliff... this would give me a focus
LIVING WITH AND BEYOND CANCER
SYMPATHY AND TRAINED STAFF
FREQUENCY INTENSITY DURATION
TAI CHI
SUPPORT NETWORK
NUTRITION
Make it easy
CAN DO!
FLEXIBLE
SPECIALIST CANCER TRAINED PT'S - UNDERSTANDING MY ENERGY, FOOD AND ABILITY
MENTAL HEALTH AND WELLBEING
BEING WITH SIMILAR PEOPLE IN OR OUT OF THE GYM
Enjoying what you eat
FAMILY AND FRIENDS
accepting who you ARE
Markers
CONTROL to go further
I go to communal walking groups or litter picking - there are people here who also have cancer and we understand each other
GET ME IN & GET IT OUT!
Part of the treatment
Keep me involved in decisions - what exercise to avoid fatigue.
Target Setting
Prehab4Cancer
I enjoyed the gym - especially rowing
I WOULD NEED SOMEONE TO PUSH ME THE RIGHT AMOUNT
Time off work - can it be an appointment?
BUDDY SYSTEM
I'd want it to come from my oncologist - facts on outcomes for encouragement
Who should you hear it from?
I'm already suffering from FATIGUE from treatment
It would fill a void before surgery
Yoga techniques helped me to keep in control during my scans
What if I didn't want to do it?
No pass or fails
Use
Amazing nurses
GET out OF THE house
Meeting the needs of all GM wide - costs, cultures and gender
NON JUDGEMENTAL
No need for expensive sportswear.
Prehab
Surgery
Rehab
JUST WEAR LOOSE CLOTHING
swimming
EMOTIONAL BENEFITS
knowing where you're going
I'll be feeling like I'm making a contribution to my own wellbeing
NHS in Greater Manchester

Information for Patients & Relatives

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



Published 16th February 2021
volume 12

frontiers in Psychology

The Role of Behavioral Science in Personalized Multimodal Prehabilitation in Cancer

Chloe Grimmett [1], Katherine Bradbury [2], Suzanne O Dalton [3 4], Imogen Fecher-Jones [5], Meeke Hoedjes [6], Judit Varkonyi-Sepp [7], Camille E Short [8 9]

* 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

GM ACTIVE – Core Team

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

Stepped Care Model (NICE 2009)

Level	Group	Assessment	Intervention
1	All the health and social care professionals	Recognition of psychological needs	Effective information giving compassionate communication and general psychological support. Solution focused.
2	Health and social care professionals with additional expertise	Screening for psychological distress	Psychological techniques such as problem solving, fatigue management etc.
3	Trained and accredited professional 	Assessed for psychological distress and diagnosis of some psychopathology	Counselling and specific psychological interventions such as anxiety management and solution-focused therapy, delivered according to explicit theoretical framework
4	Mental health specialists	Diagnosis of psychopathology	Specialist psychological and psychiatric interventions such as psychotherapy, including cognitive behavioural therapy (CBT

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**

- Charities
- Professional bodies/colleges
- NHS organisations
- Academic Institutions
- Exercise focused organisations (UK Active, CIMPSA, REPs, SportEngland)

WE ARE MACMILLAN. CANCER SUPPORT

Royal College of Occupational Therapists

PRosPER (Personalised Care, Prehab & Rehab training):

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

Who we are


boltonarena
Bury COUNCIL
Link4Life
Bolton Community Leisure
Oldham active
Inspiring healthy lifestyles
Salford Community Leisure
MCRactive
ACTIVE TAMESIDE
Trafford Leisure
FORUM
lifeLEISURE
liveFITNESS liveSPORT liveLIFE
Greater Manchester Moving
GM ACTIVE

Path of least resistance

Assessment Clinic Overview

Functional Capacity

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

Questionnaires

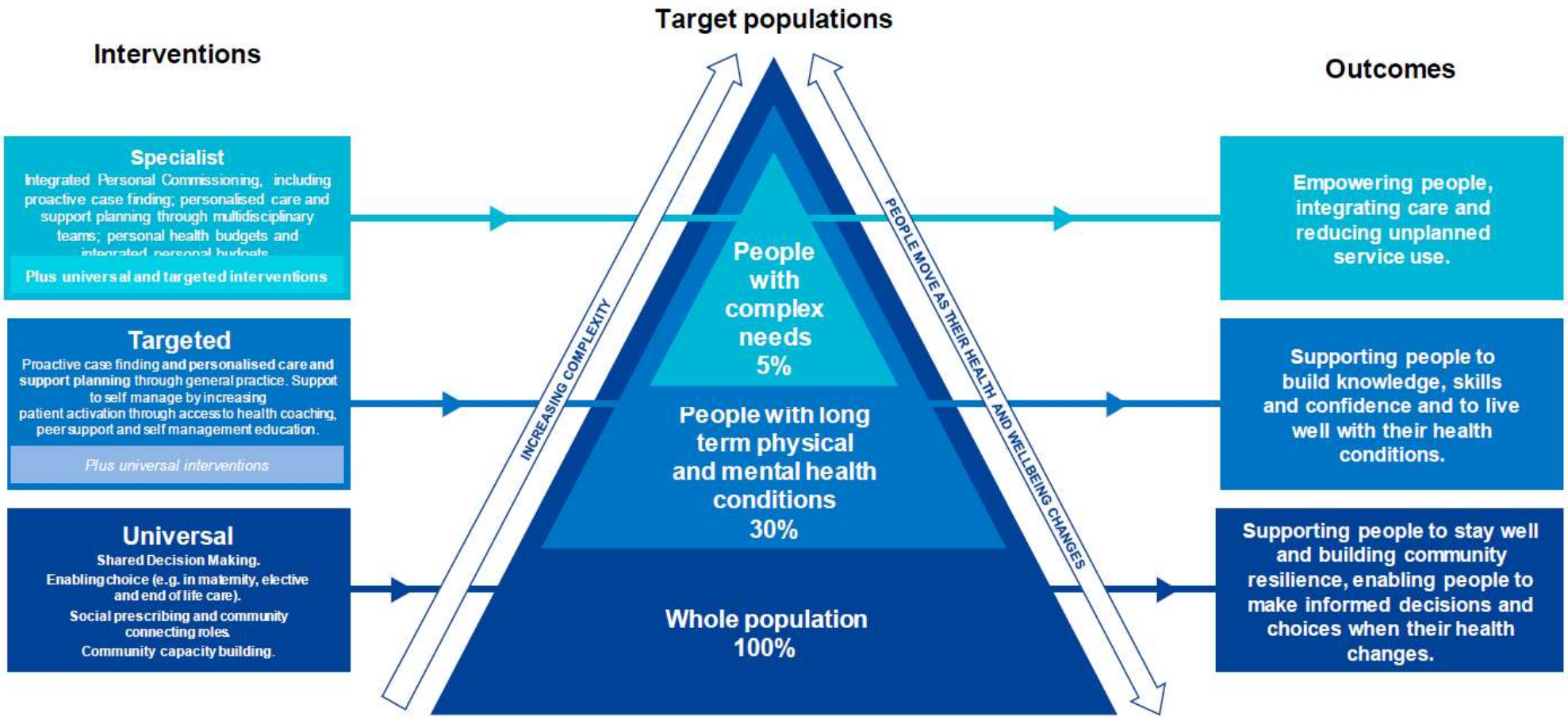
- EQ5D-5L
- IPAQ
- Self Efficacy Scale
- Rockwood Frailty
- WHODAS 2.0
- EORTCQLQ-C30

Health checks

- Blood pressure
- Height
- Weight
- Resting HR
- Oxygen stats
- PG-SGA

Comprehensive Personalised Care Model

All age, whole population approach to Personalised Care



NHS England (2019) *The NHS Long Term Plan.* London: NHS England.

Programme Model - Surgical/Rad/Chemo

Pre-Treatment

Assessment

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

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

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

During treatment

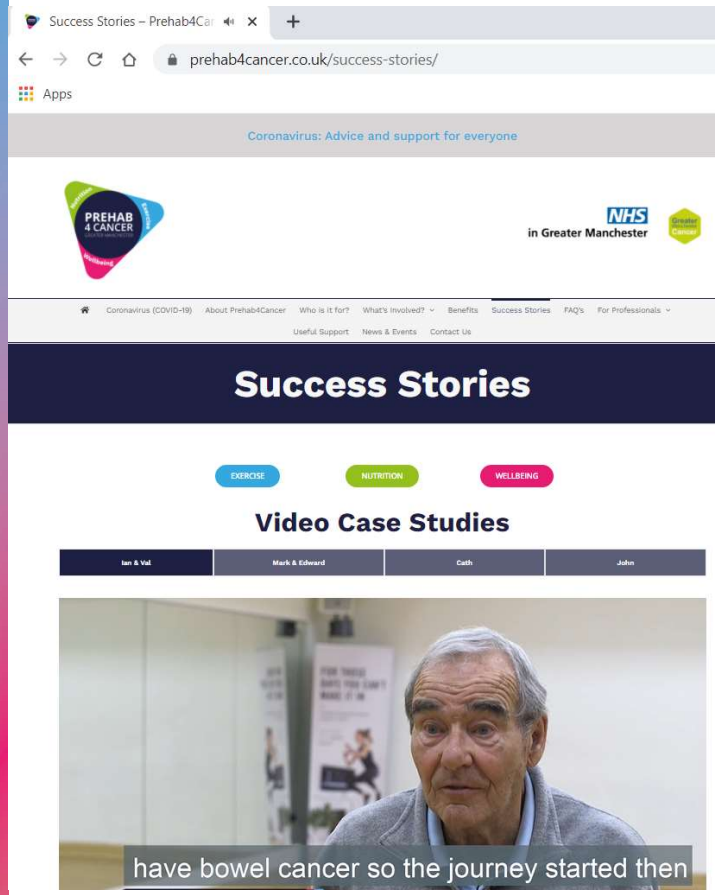
- No expectation or target number of sessions
- Patients receive support contact calls from specialists with advice and education around fatigue management
- Offer of supporting patient to maintain some level of activity
- Any pre prescribed programme is adjust for frequency, intensity & duration to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

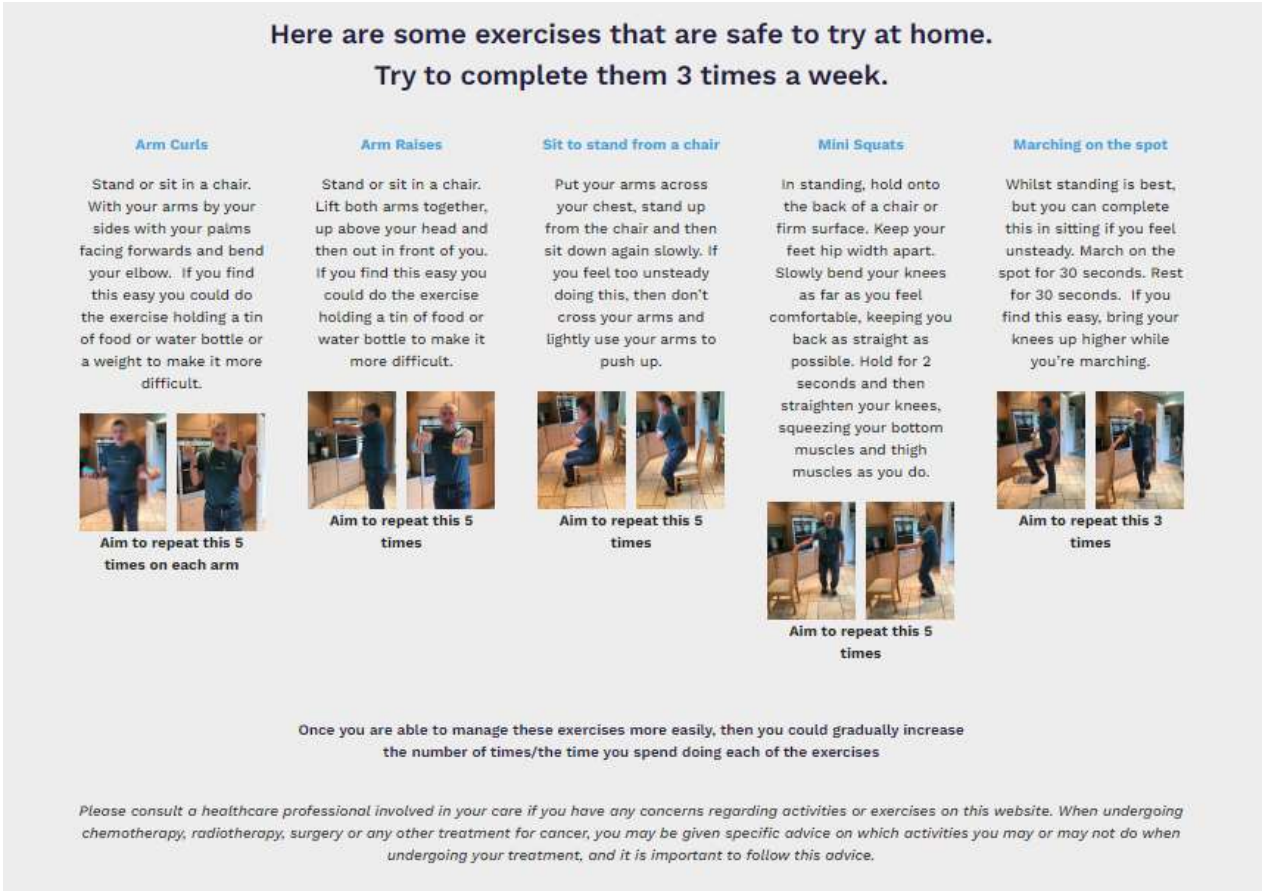
Rehab *12 weeks*

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

www.prehab4cancer.co.uk



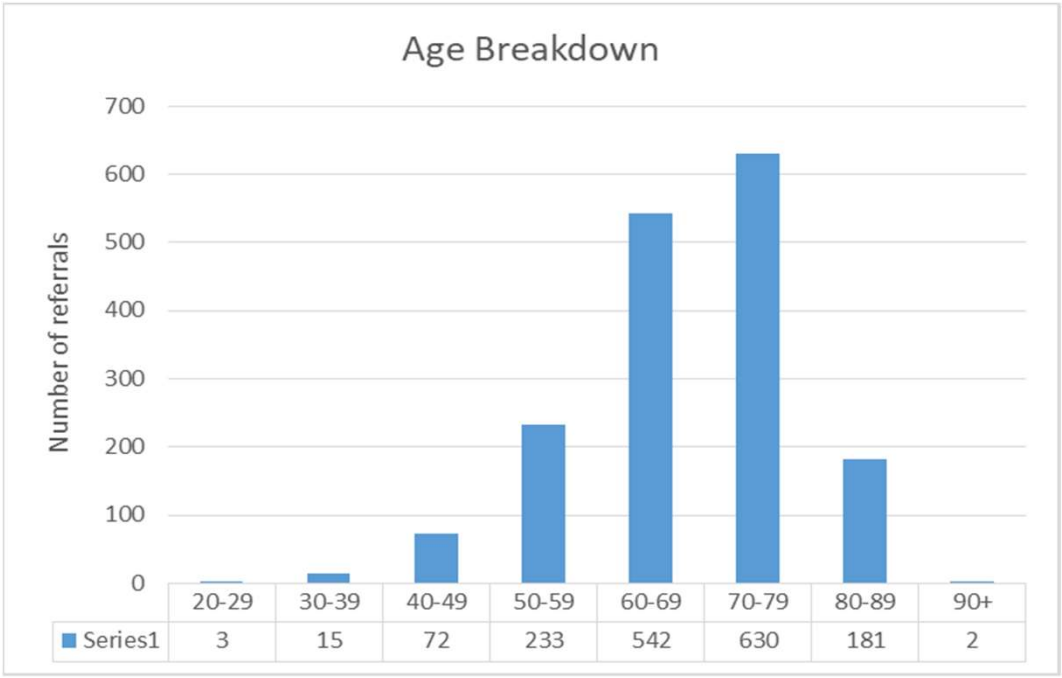


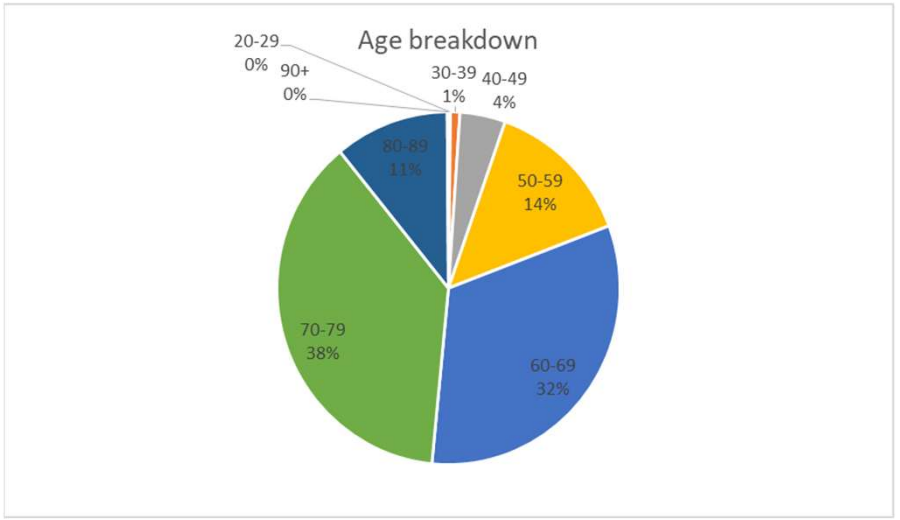
Launched April 2019….

- **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)

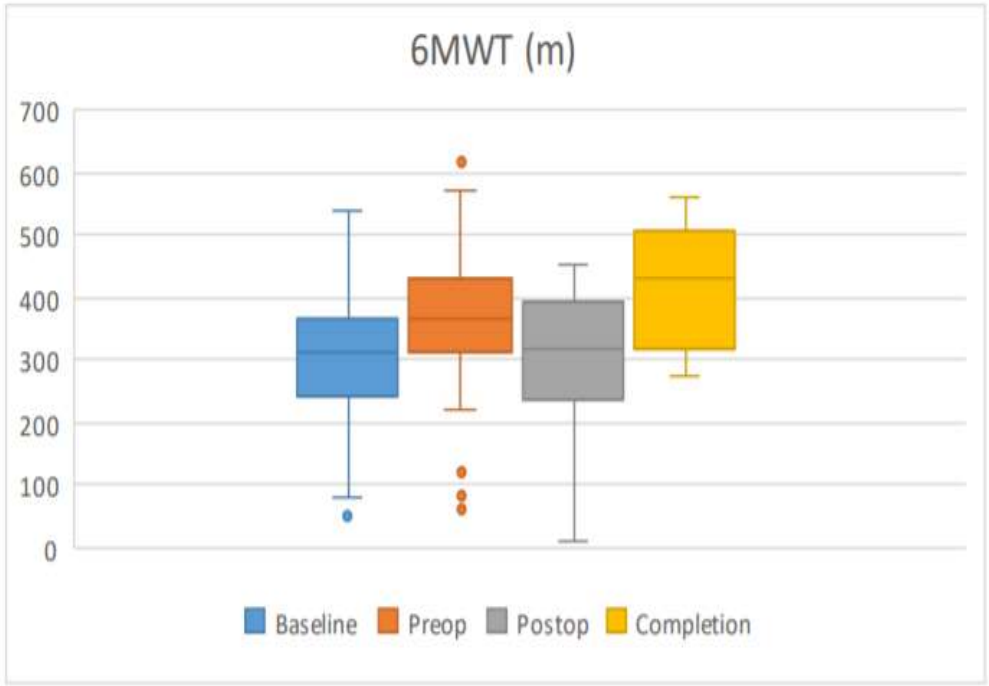
Age SHOULD NOT be a BARRIER to exercise…

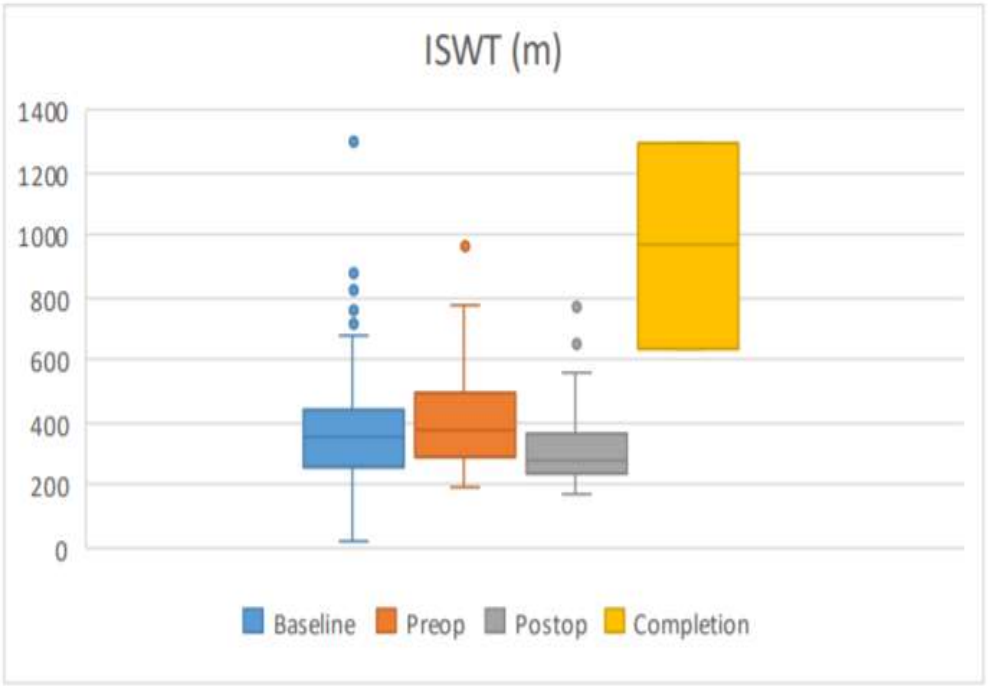




GM Patient level data average (mean)	Baseline	Pre-operative	Difference	Post-operative	Discharge	Difference
Physiological assessments						
Weight (kg)	77.5	76.9	-0.6	74.1	74.3	0.2
BMI (kg/m^2)	27.2	27.1	-0.1	27.1	26	-1.1
Sit to Stand (reps/min)	19	24	5	21	28	7
6MWT (m)	321.7	371.8	50.1	338.1	407.8	78.4
ISWT (m)	384.9	450.7	65.8	383.5	456.7	98.5
Survey assessments						
WHODAS	6	3.8	-2.1	5.4	2.5	-2.8
Self-efficacy scale for exercise	61.8	69.2	7.4	65.5	72.3	6.7
FURTHER STATISTICAL DATA ANALYSIS TO BE COMPLETED						

Physiological assessments (walk tests) LUNG

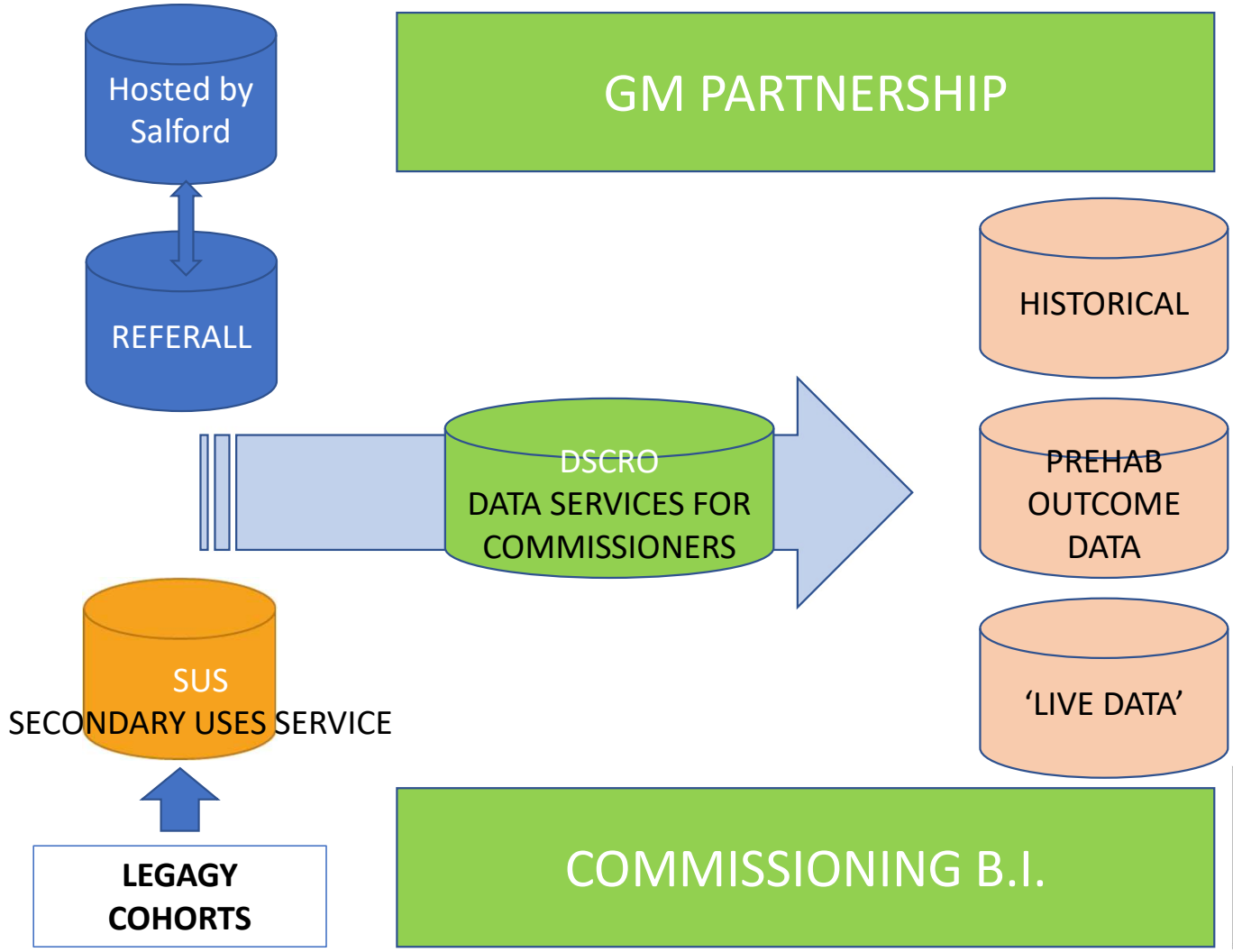




Six Minute Walk Test (6MWT) – frail, older patients or those contraindicated for the ISWT.

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

Cost Effectiveness Evaluation - Sustainability



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

SCW Joining the dots across health and care

UoM P4C Acceptability study

Dr Rachael Powell (Health Psychologist), Zoe Merchant (OT), Kirsty Rowlinson-Groves, Dr John Moore, Dr David French (Health Psychogist)

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

NEXT STEPS

European Journal of Surgical Oncology
Volume 47, Issue 3, Part A, March 2021, Pages 524-532

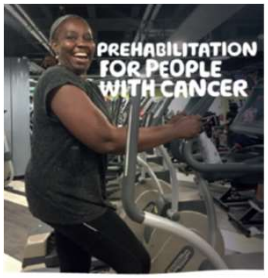
Implementing a system-wide cancer prehabilitation programme: The journey of Greater Manchester's 'Prehab4cancer'

John Moore [a], Zoe Merchant [b], Kirsty Rowlinson [c], Karen McEwan [d], Matthew Evison [e], Gemma Faulkner [f], Javed Sultan [g], Jamie S. McPhee [h], James Steele [i]

- **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

NHS in Greater Manchester
Manchester 1824 The University of Manchester
UK active More people More active More often
University of Southampton
Sheffield Hallam University
Manchester Metropolitan University
Macmillan Cancer Support
Faculty of Sport and Exercise Medicine UK
NHS South Tees Hospitals NHS Foundation Trust
National Centre for Sport & Exercise Medicine Working for Health & Wellbeing



PQIP Perioperative Quality Improvement Programme
The AHSN Network
GMCA Greater Manchester Combined Authority
GM Active Greater Manchester Cancer
Macmillan Cancer Support
ERAS
Health Innovation Manchester
Greater Manchester Health and Social Care Partnership


PREHAB 4 CANCER
GREATER MANCHESTER
Nutrition
Exercise
Wellbeing
@prehab4cancer
"When I first went I thought, what the bloody hell am I doing here, I must be mad"
"Having a diagnosis of a life threatening illness made me feel I had to do it"
What would you say to someone else who was just starting on the programme?
"For someone that's ill I feel really well"
"When I've been feeling really low I can concentrate on my wellbeing at the gym – made me feel better about myself"
"Being part of the programme has made me think about my health"
"Gym can feel intimidating so went as a group the first time"
"I'm in a better position for treatment"
"It's had a positive impact on my post op complications"
"Surgeons said I had to get fitter and put weight on or I would be dead, so it was a no brainer!"
"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 was told we're going to get you fitter to get you out of hospital quicker, that was all the motivation I needed"
"Trainer gives us confidence"
"I'm better able to face surgery"
Did you want to take part?
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?
"People in hospital at the same time as me who'd not been through the programme struggled to get out of bed"
"If it wasn't for prehab I wouldn't have been able to have the op – I failed the shuttle test"
"I see this as part of my treatment"
"The gym gave me a focus and I felt in control"
"I was very weak after the op – the trainer took it slowly"
"I was better able to cope with cancer and the treatment"
"Do it – don't be frightened"
"It's helping me with my chemo – I come the day before I have chemo and I feel better"
"It was great that there were 3 different gyms available for me to use"
"I had no doubts about taking part, the trainer knew her stuff"
"Prehab helped me to leave hospital early"
"Going to the sessions gave me confidence and a purpose"
"The advice was well balanced, including 'don't do too much'!"
How did you feel about coming back to the Rehab phase?
Has prehab had helped you during and after treatment?
"prehab better than expected"
"It was important the health centre was near to where I live"
If you weren't offered prehab would you have gone to the gym?
"I feel stronger and have less fatigue"
"Do it at your own pace"
"I had to lose weight or they wouldn't give me the operation"
One person responded yes, the rest said no!
"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"
"Tailoring the program to my needs important – giving me home exercises"
Greater Manchester Cancer
ERAS
Greater Manchester Health and Social Care Partnership
UK active More people More active More often
Health Innovation Manchester
Greater Manchester Moving
MACMILLAN CANCER SUPPORT
GM ACTIVE
ReferAll
GMCA GREATER MANCHESTER COMBINED AUTHORITY
NHS in Greater Manchester

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

INTERNATIONAL ASSOCIATION FOR THE STUDY OF LUNG CANCER

GrangerCL

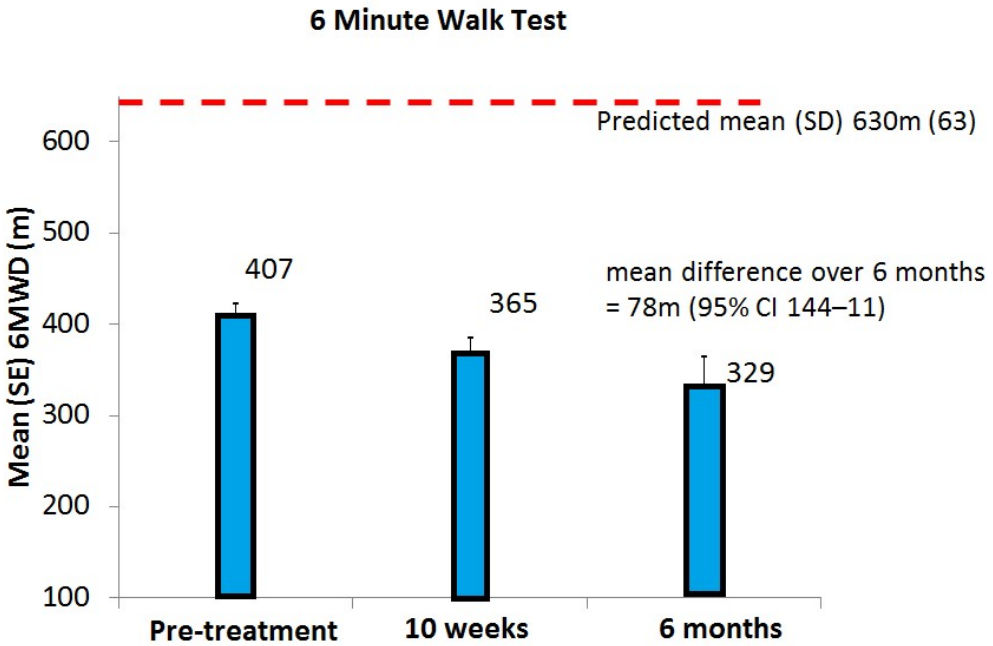
Lung cancer is associated with significant morbidity[1]

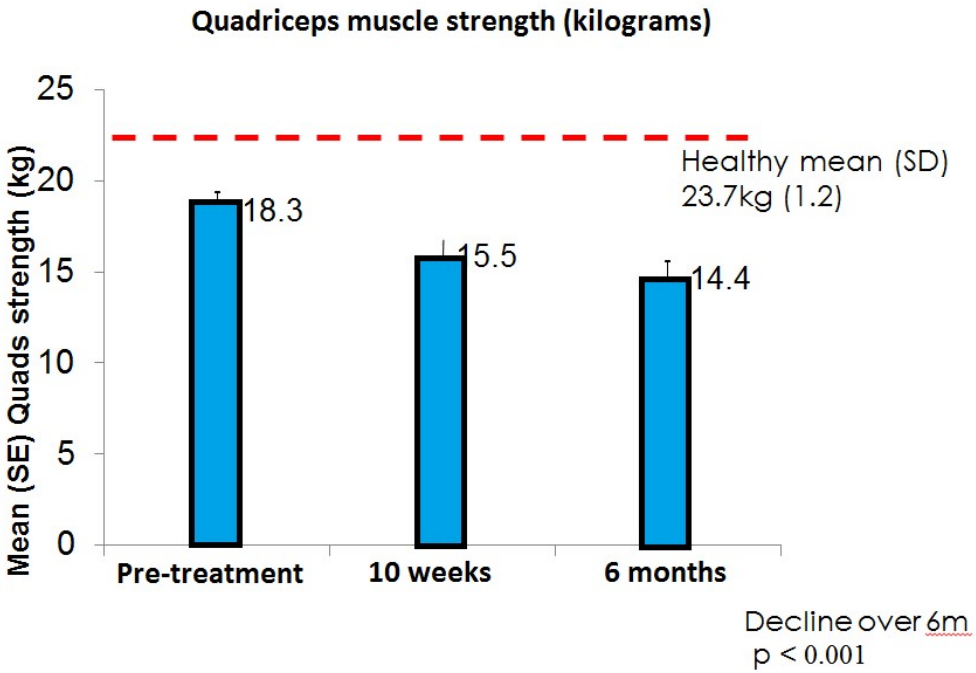
IASLC

GrangerCL

[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]





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[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]

GrangerCL

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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

GrangerCL

[1] Granger et al. *Lung Cancer* 2014; [2] Edbrooke, Granger et al. *J Clinical Med* 2019;

Lung cancer is associated with significant morbidity[1]

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Physical activity and **exercise is effective** at improving physical and psychological outcomes[3]

GrangerCL

[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]

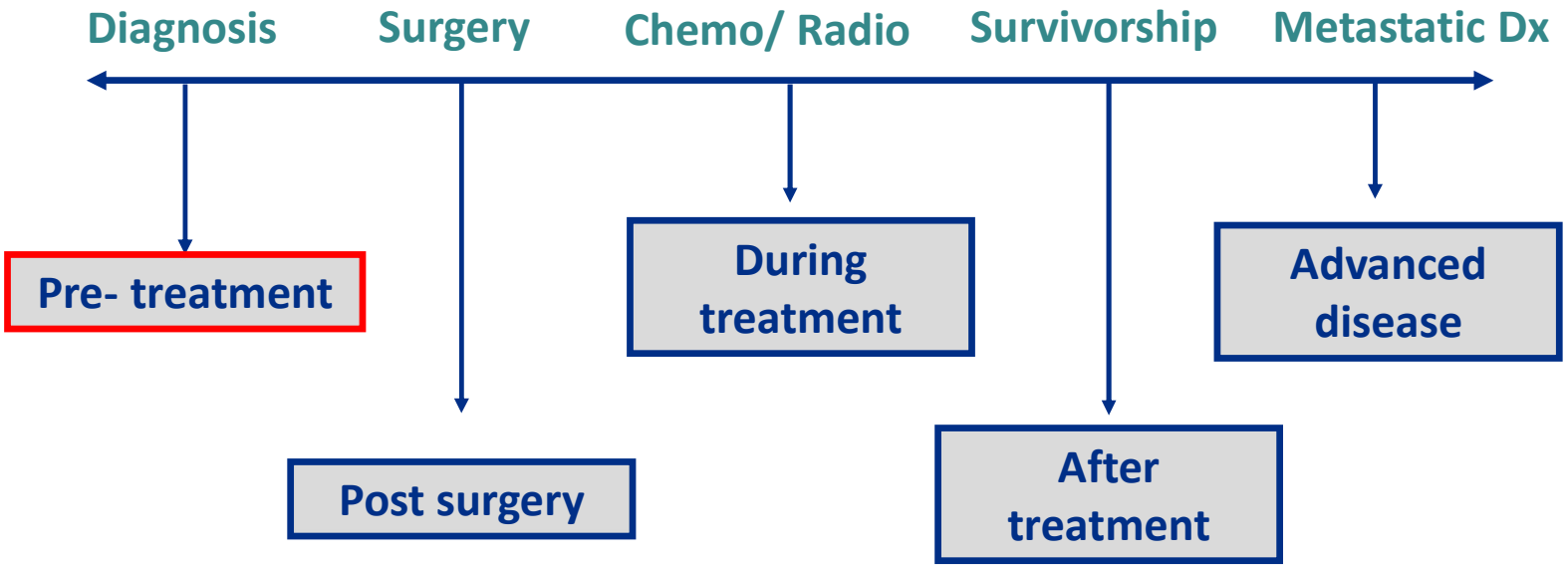
Physical activity and **exercise is effective** at improving physical and psychological outcomes[3]

Programs for lung cancer are **infrequent world-wide**

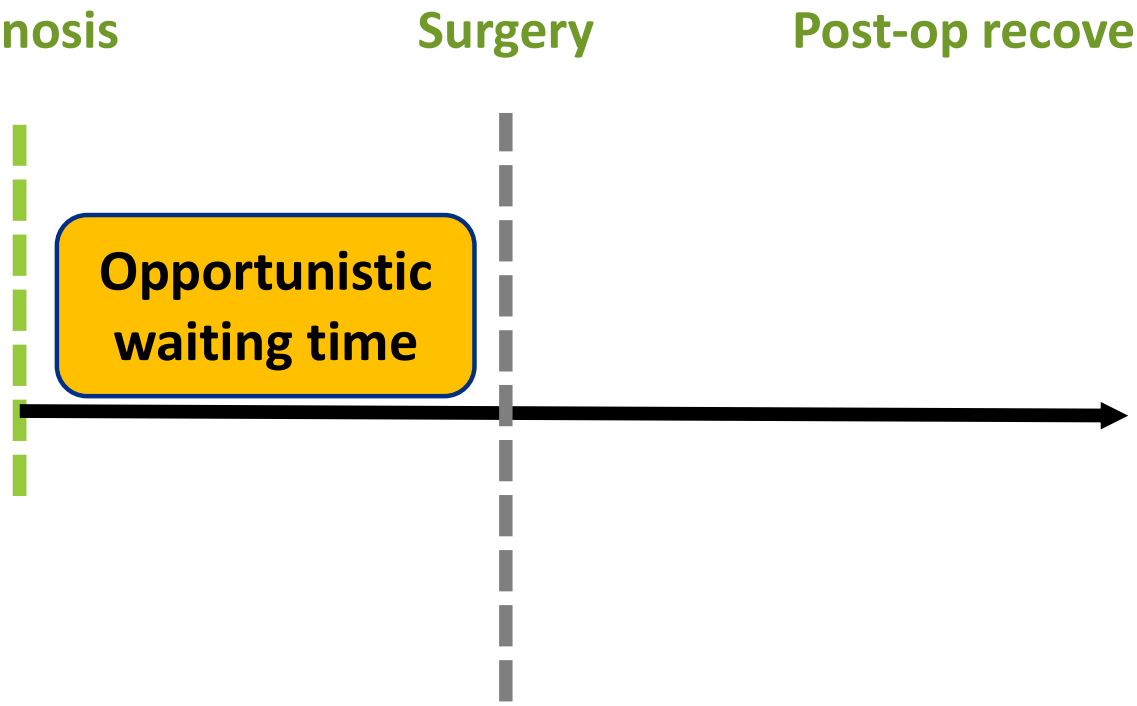
GrangerCL

[1] Granger et al. *Lung Cancer* 2014; [2] Edbrooke, Granger et al. *J Clinical Med* 2019; [3] Cavalheri & Granger. *Respirology* 2020

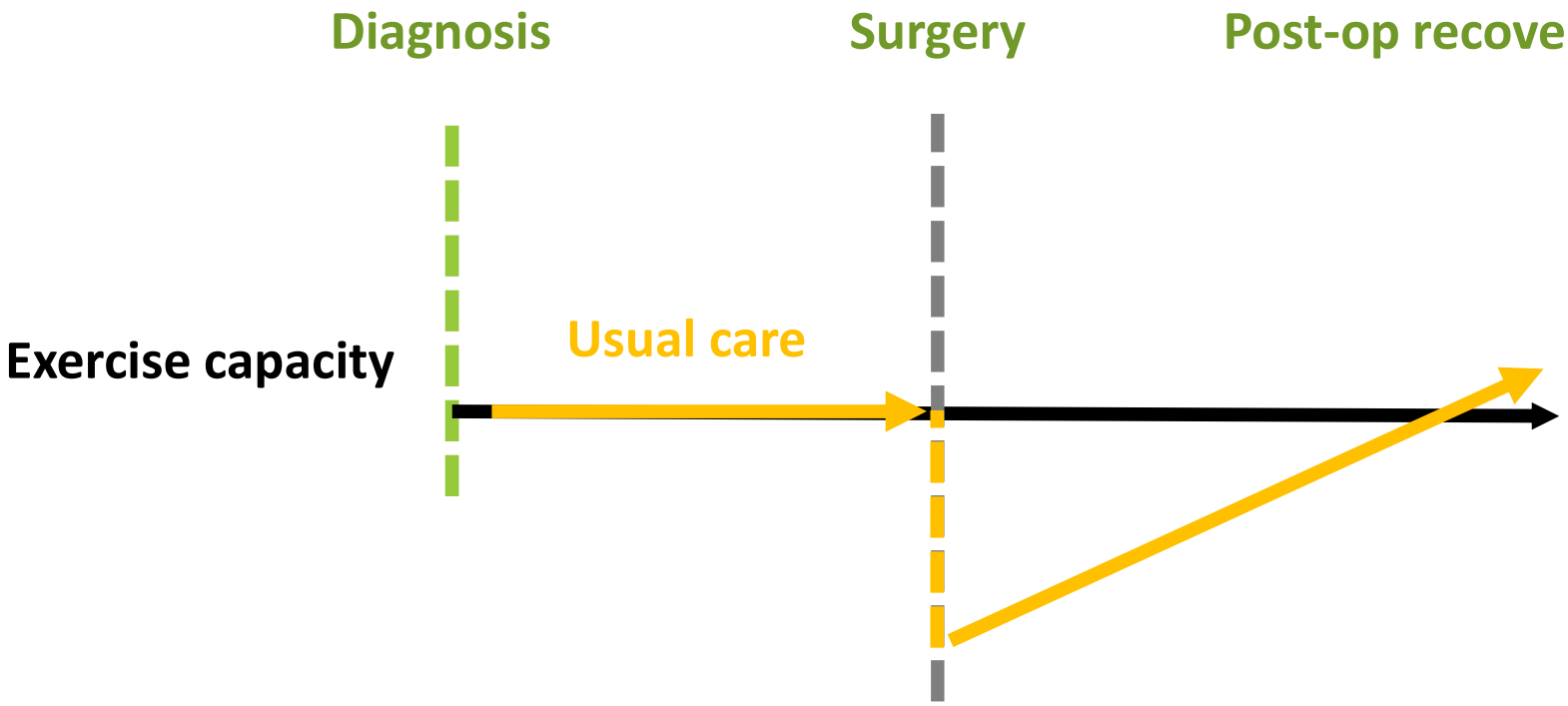
Potential Exercise Training Timepoints in Lung Cancer



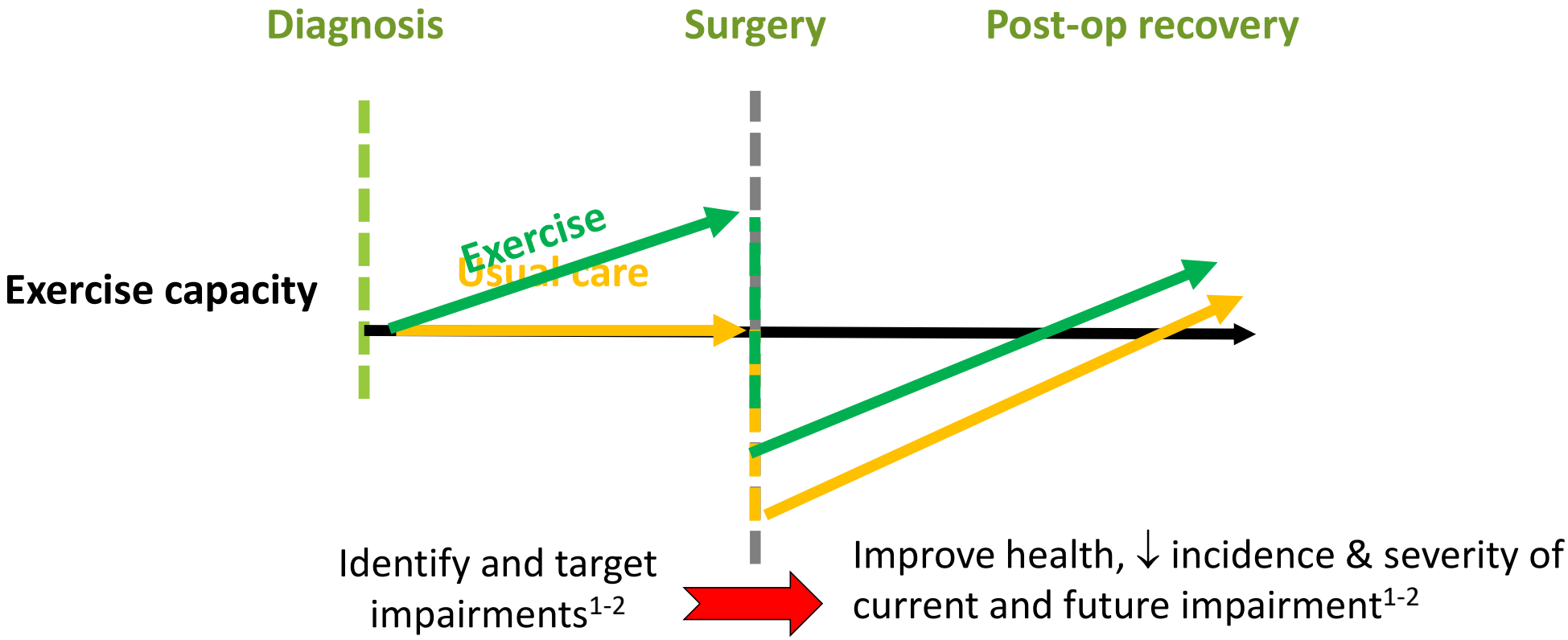
Pre-operative exercise training in lung cancer



Pre-operative exercise training in lung cancer



Pre-operative exercise training in lung cancer



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[1] Carli et al. *Phys Med Rehabil* 2017; [2] Silver et al. *Am J Phys Med Rehabil* 2013

Rational of pre-operative exercise in lung cancer

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

[1] ERS/ESTS guidelines 2009; [2] ACCP guidelines 2013; [3] Lindenmann et al. *Cancers* 2020; [4] Lugg et al. *Thorax* 2016; [5] Kaufmann et al. *Acta Anaesthesiol Scand* 2019

Rational of pre-operative exercise in lung cancer

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- **PPCs = increase ICU admissions, length of stay, re-admissions, early and late mortality[4-5]**

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[1] ERS/ESTS guidelines 2009; [2] ACCP guidelines 2013; [3] Lindenmann et al. *Cancers* 2020; [4] Lugg et al. *Thorax* 2016; [5] Kaufmann et al. *Acta Anaesthesiol Scand* 2019

Rational of pre-operative exercise in lung cancer

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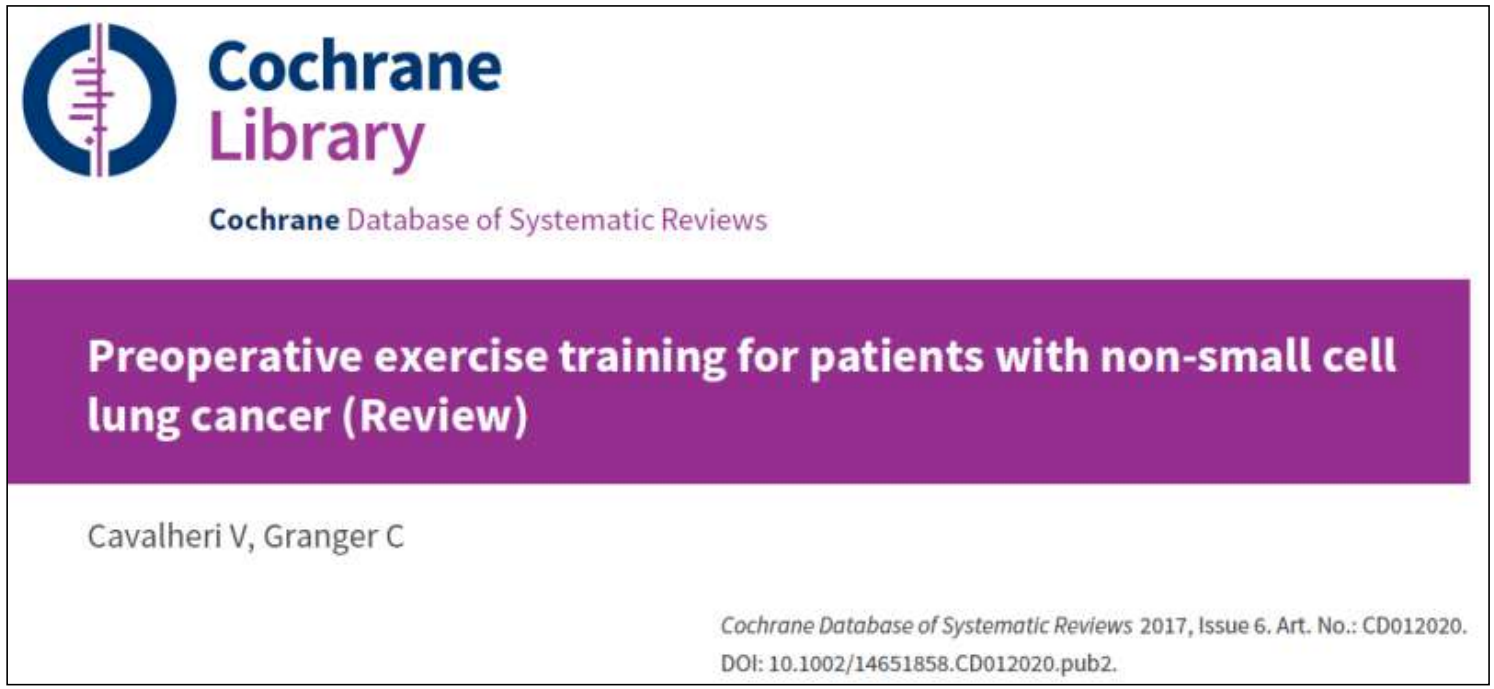
- PPCs = increase ICU admissions, length of stay, re-admissions, early and late mortality[4-5]

› **Preoperative exercise training:**

- **Potential improvement in VO_{2peak}**
- **? Improvements in PPC and other postoperative outcomes**

[1] ERS/ESTS guidelines 2009; [2] ACCP guidelines 2013; [3] Lindenmann et al. *Cancers* 2020; [4] Lugg et al. *Thorax* 2016; [5] Kaufmann et al. *Acta Anaesthesiol Scand* 2019



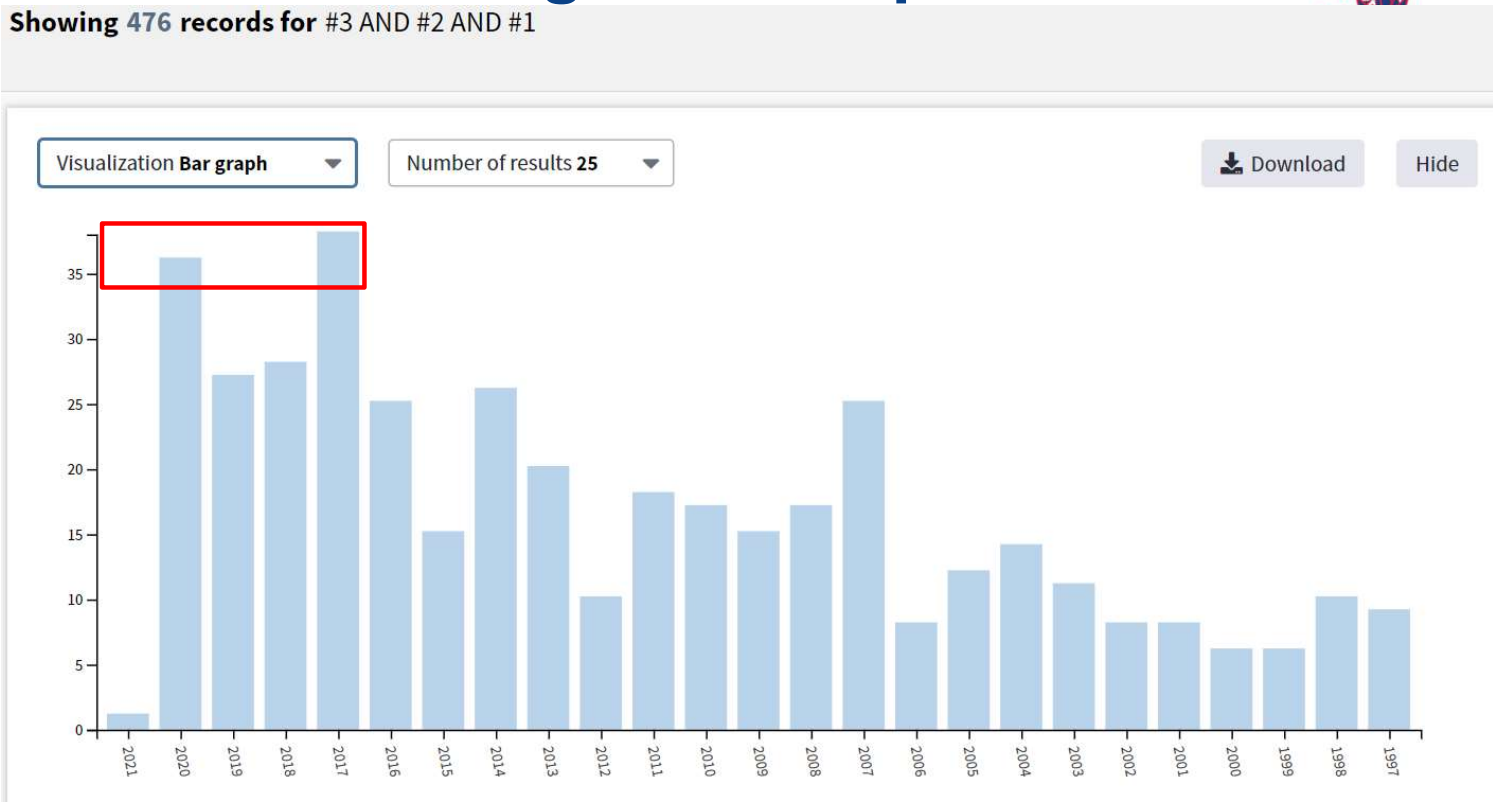
IASLC

Update in progress during 2021

GrangerCL

Pre-operative exercise and lung cancer - publications

- Preliminary medline search December 2020



GrangerCL

Critical Reviews in Oncology / Hematology 156 (2020) 103086

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journal homepage: www.elsevier.com/locate/critrevonc

European School of Oncology – Review

Exercise and lung cancer surgery: A systematic review of randomized-controlled trials

Caroline Himbert [a,b,1], Nicole Klossner [a,1], Adriana M. Coletta [a,c], Christopher A. Barnes [d,e,f], Joachim Wiskemann [g], Paul C. LaStayo [c,d], Thomas K. Varghese Jr. [e,f], Cornelia M. Ulrich [a,b,*]

Received: 26 June 2020 | Revised: 28 August 2020 | Accepted: 11 September 2020

DOI: 10.1111/jocn.15511

Journal of Clinical Nursing WILEY

REVIEW

Effects of perioperative exercise interventions on lung cancer patients: An overview of systematic reviews

Weijiao 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

ORIGINAL ARTICLE

Exercise prescription for symptoms and quality of life improvements in lung cancer patients: a systematic review

Alberto Codima [1] · Willian das Neves Silva [1,2] · Ana Paula de Souza Borges [1,2] · Gilberto de Castro Jr [1,2]

cancers

Review

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 Ramírez-Vélez [1], Alejando Lucia [2,3,4], Nicolas Martínez-Velilla [1,4], Alejandro Santos-Lozano [2,5], Pedro L. Valenzuela [6], Idoia Morilla [1] and Mikel Izquierdo [1,4,*]

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

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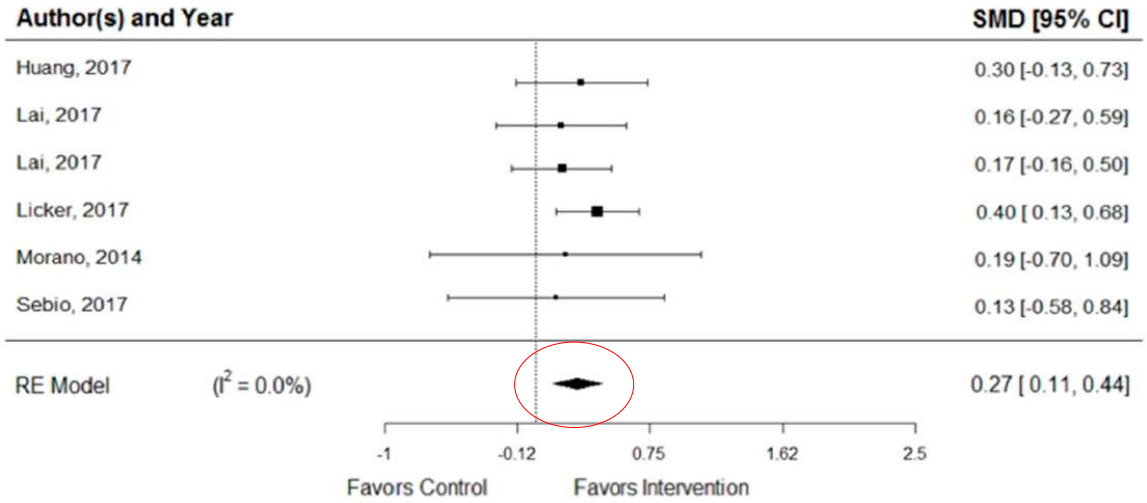
- **Training:**
  - Aerobic exercise (walking +/- stationary cycling)**
  - Resistance training
  - +/- inspiratory muscle training
- **Intensity**: mod to high (50 to 80% Wmax / 80 to 100% Wmax)

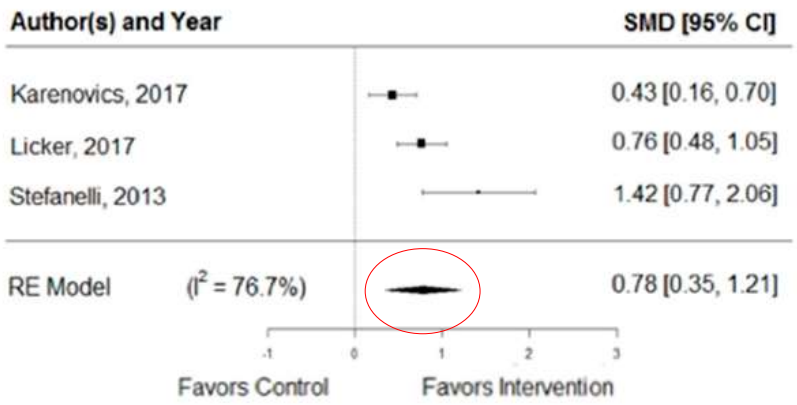
[1] Rosero et al. *Cancers* 2019; [2] Himbert et al. *Critical Reviews in Oncology / Hematology* 2020

Outcomes: ↑ exercise capacity post-program

6 minute walk test



VO_2 peak



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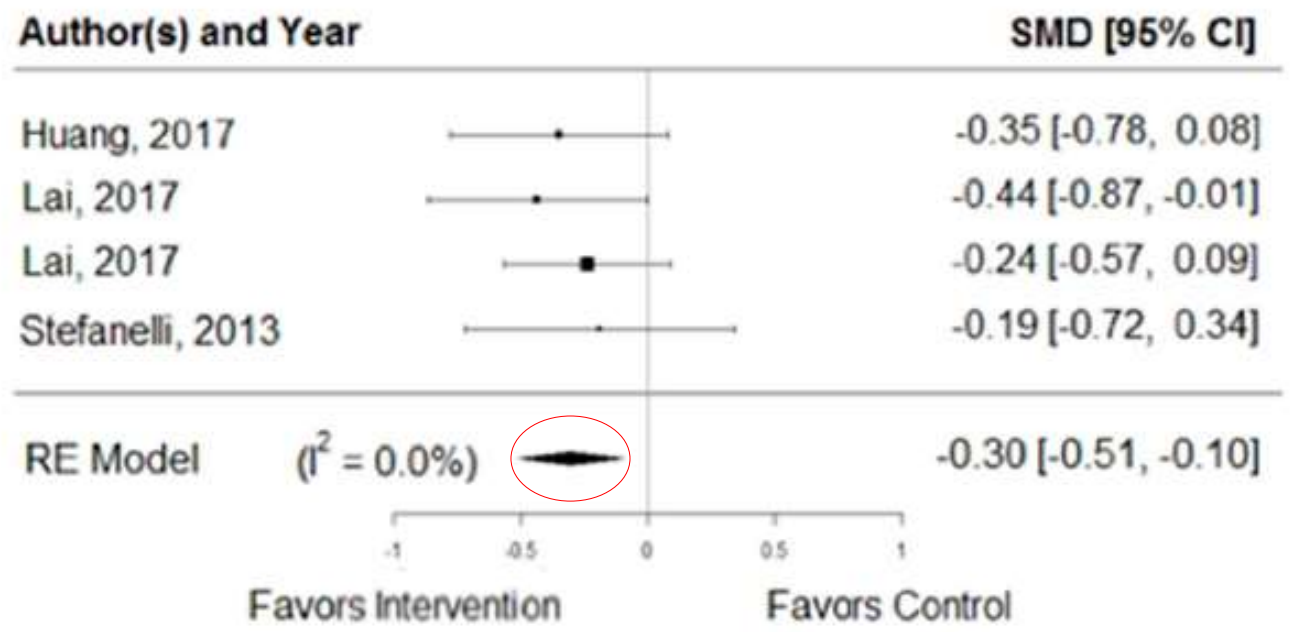
[1] Rosero et al. *Cancers* 2019

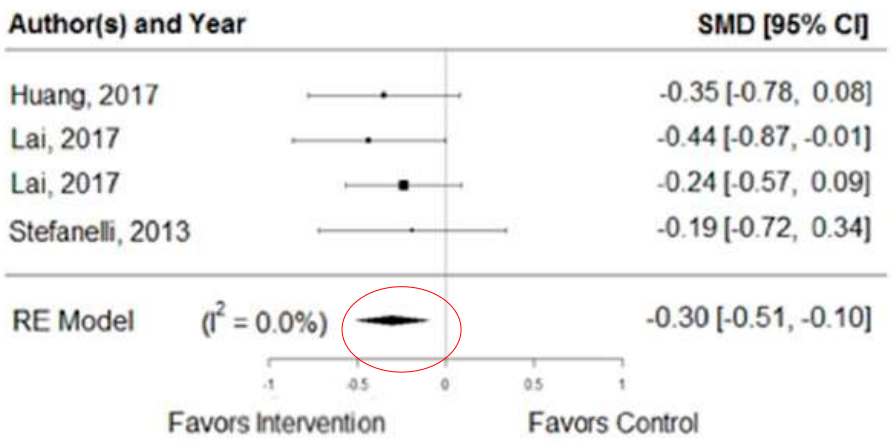
Outcomes: ↓ dyspnoea post-program



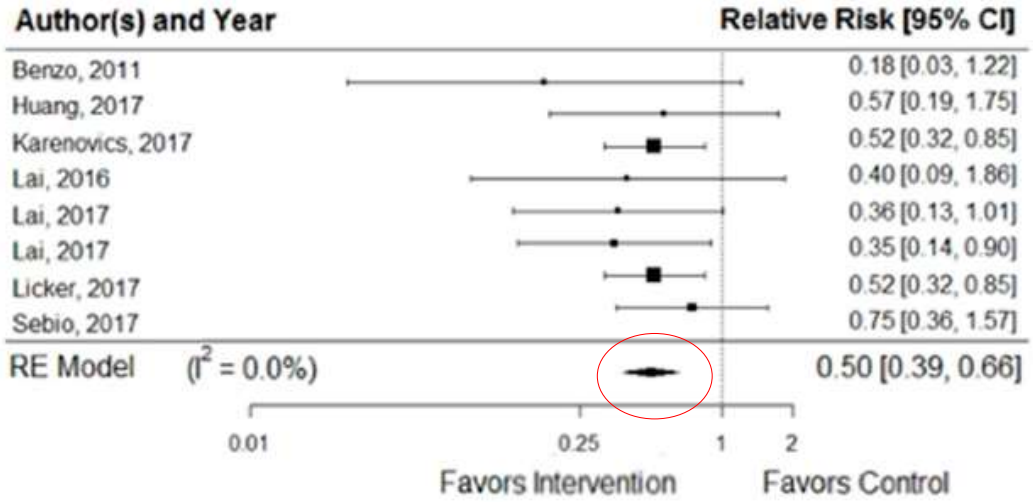
[1] Rosero et al. *Cancers* 2019

Outcomes: ↓ pulmonary complications & length of stay after surgery

Post op pulmonary complications



Hospital length of stay



[1] Rosero et al. *Cancers* 2019

Long term outcomes are unclear

› 1 year follow-up[1]

European Journal of Cardio-Thoracic Surgery 0 (2017) 1–8
doi:10.1093/ejcts/ezx030

ORIGINAL ARTICLE

Winner of the 2016 ESTS Brompton Prize

Cite this article as: Karenovics W, Licker M, Ellenberger C, Christodoulou M, Diaper J, Bhatia C *et al.* Short-term preoperative exercise therapy does not improve long-term outcome after lung cancer surgery—a randomized controlled study. Eur J Cardiothorac Surg 2017; doi:10.1093/ejcts/ezx030.

THORACIC

Short-term preoperative exercise therapy does not improve long-term outcome after lung cancer surgery: a randomized controlled study†

Wolfram Karenovics[a,*], Marc Licker[b], Christoph Ellenberger[b], Michel Christodoulou[c], John Diaper[b], Chetna Bhatia[b], John Robert[a], Pierre-Olivier Bridevaux[d] and Frédéric Triponez[a]

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

→ Both groups had similar decline in:

→ VO_2peak = mean 12% (95% CI 5 to 18)

→ Peak work rate = mean 11% (95% CI 4 to 17)

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[1] Karenovics et al. *Eur J Cardiothorac Surg* 2017

Cost effectiveness is unclear

Original Article

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Impact of one-week preoperative physical training on clinical outcomes of surgical lung cancer patients with limited lung function: a randomized trial

Yutian Lai[1#], Xin Wang[1,2#], Kun Zhou[1], Jianhuan Su[3], Guowei Che[1]

n = 68

Primary outcome = change in 6min walk post-program

- ↓ 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

[1] Lai et al. *Ann Transl Med* 2019

Barberan-Garcia *et al. BMC Health Services Research* (2020) 20:207
https://doi.org/10.1186/s12913-020-05078-9

BMC Health Services Research

STUDY PROTOCOL Open Access

Cost-effectiveness of a technology-supported multimodal prehabilitation program in moderate-to-high risk patients undergoing lung cancer resection: randomized controlled trial protocol

- 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_2peak) – this appears to be essential

From individual trials:

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

Aerobic exercise in combination with IMT is superior to IMT[2]

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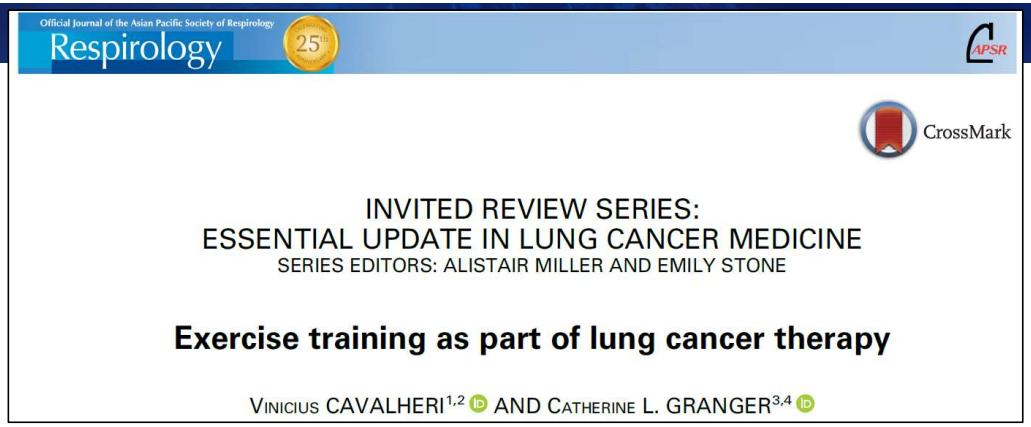
[1] Laurent et al. *Eur J Phys Rehabil Med* 2020; [2] Huang et al. *J Thorac Dis* 2017



Official Journal of the Asian Pacific Society of Respirology
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INVITED REVIEW SERIES:
ESSENTIAL UPDATE IN LUNG CANCER MEDICINE
SERIES EDITORS: ALISTAIR MILLER AND EMILY STONE

Exercise training as part of lung cancer therapy

VINICIUS CAVALHERI[1,2] AND CATHERINE L. GRANGER[3,4]

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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?

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[1] Cavalheri & Granger. *Respirology* 2020

Summary

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Pre-operative exercise training for lung cancer in 2021

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Summary

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Safe and acceptable

? Feasible

Pre-operative exercise training for lung cancer in 2021

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Summary

Safe and acceptable

? Feasible

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

Pre-operative exercise training for lung cancer in 2021

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Summary

Safe and acceptable

? Feasible

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

Pre-operative exercise training for lung cancer in 2021

Small sample sizes

Low quality

Need long-term outcomes

Need cost effectiveness

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Summary

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Safe and acceptable

? Feasible

↑ Exercise capacity
↓ Dyspnoea
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Pre-operative exercise training for lung cancer in 2021

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

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Resources

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Thank you

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The Royal Melbourne Hospital

VICTORIAN CANCER AGENCY

VICTORIA State Government

Cancer Council Victoria

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