
# 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

## Acknowledgements

The development of these principles and guidance would not have been possible without the support, dedication, expertise and commitment of a large number of people from across the UK and internationally (Appendix 1) for which Macmillan, the Royal College of Anaesthetists and the National Institute for Health Research Cancer and Nutrition Collaboration are extremely grateful.

# Contents

# Forewords

## People with cancer

**Jenny Doe**

‘Getting a cancer diagnosis collapses your whole world, and it's really hard to think straight. Advice from professionals, friends and colleagues, information from websites and an avalanche of leaflets, offer bewildering quantities of information. One way to manage the intense anxiety, and paralysing uncertainty about your future is to try to take one day at a time. Much of what happens next is out of your hands, and sometimes the treatment can be experienced as more painful and challenging than the actual symptoms of your cancer.

Over days in hospital for surgery, weeks of daily radiotherapy, months of exhausting chemotherapy, you learn how to be a cancer patient. The experience is likely to change who you are, you might even decide to make significant lifestyle changes, using your diagnosis as a wakeup call; or you might just want to get through the whole thing and forget it as quickly as you can.

Getting a grip on the whole process, to make your treatment more bearable and effective, and your recovery speedier, and to make optimal use of the available support and resources on offer, could alter both your experience of cancer treatment, and the eventual outcome. It could transform a devastating year of feeling helpless and terrified, into a challenging opportunity to take back some control. There's a myth that adopting a positive attitude can help. Well it might, but you might want to rant and rave at the universe in anger, weep daily tears, or withdraw from the world into numb hibernation – and all those are legitimate responses too. But what evidence is there that anything you might decide to do can prepare you optimally for the rigours of the treatment you're about to embark upon?

That's the idea of prehabilitation. It will arm you with scientifically researched knowledge, skills, habits and routines that can take the edge off the discomfort, give you back some control, and may enhance the effectiveness of your treatment. It will show those around you, and yourself, that you're not a victim of cancer, or a passive recipient of medical input. You're now enrolled into a whole new enterprise that you never wanted to be part of – it chose you. But now you're in the Cancer Club, being an active participant in the difficult times ahead can make your journey smoother – and Prehabilitation is the travel guide I definitely wish I'd had when I first set off...’

**Clive Moore**
I personally am 100% behind the prehabilitation ethos. People need to be mentally, physically and emotionally as ready as possible to face the challenge of cancer in their own chosen way.

Jenny is so right when she says that you are bombarded with information, leaflets and advice but this is in a haphazard way and I'm sure depends on what hospital you attend and who you see. What is required is a clear structured policy offered across the board to advise and prepare patients for their treatment in whatever form that will be.

Generally, I have found that people with cancer have a desire to feel that they are doing something positive to help themselves. Unfortunately, by the time they have wadded through the minefield of information/ misinformation their treatment is upon them and they are still in the mire not knowing which way is up.

Personally, I had a radical prostatectomy and from all the information I received chose what I believed was right for me. I lost weight, increased the exercise I was taking, ate more healthily and put all my affairs in order. I also stopped drinking tea, coffee, fizzy drinks etc as I knew these would be off the menu after the op, this meant I didn't have to miss the caffeine hit afterwards (I was a 10–12 cups of tea/coffee a day man).

Being a bloke, cowboys don't cry, and all those emotions didn't really come into the equation with me. I have and wife and three daughters however who were decimated, and it brought home to me that it wasn't about me it was about us as a family. Them seeing my own regime of prehabilitation meant that they could draw strength from the fact that I was being positive and proactive in trying to help myself. I think it goes without saying that the family as a whole should be included in the prehabilitation package.'

**Della Ogunleye**
'An initial assessment will definitely pick up how fit you are before treatment. The chemotherapy had a very adverse side effects from nausea to acute fatigue very disoriented. I was malnourished and had to take oral nutrition supplements!!!

Looking back on my fitness regime if I was that fit during treatment I would have coped much better and this in turn will aid recovery not going into depression much later.

I had a few sessions provided by the Macmillan service psychological interventions from St George's. as I was initially referred to IAPT (Improving Access to Psychological Therapies) but one hospital got back to me much later when it was too late.

I am now going to the gym and I feel much better but psychological and mentally.

I will recommend prehab. For all newly diagnosed cancer patients.'

## Macmillan Cancer Support

**Dr Fran Woodard, Executive Director, Policy and Impact**

I am delighted to bring you this principles and guidance about prehabilitation within the management and support of people with cancer developed in partnership with the Royal College of Anaesthetists and the National Institute for Health Research Cancer and Nutrition Collaboration. This is the first guidance of its kind in the UK and has been informed by experts both from the UK and across the World.

Prehabilitation enables people with cancer to prepare for treatment by promoting healthy behaviours and prescribing exercise, nutrition and psychological interventions where appropriate to a person's needs. Prehabilitation should be implemented as early in the patient pathway as is possible, ideally soon after diagnosis, and as well in advance of treatment as possible for maximum benefit. Prehabilitation should be seen as part of a continuum such that prehabilitation is part of the rehabilitation pathway.

You wouldn't run a marathon without undertaking any training and prehabilitation aims to optimise a person's health and wellbeing to help maximise their resilience to treatment throughout their journey.

This document endorses the benefits of prehabilitation which include improving cardiovascular fitness, improving nutritional status, enhancing quality of life, reducing length of stay and enhancing recovery.

People affected by cancer have advised us how valuable they find taking control of their health and wellbeing early in their cancer journey and there is a growing body of scientific evidence that supports preparing newly diagnosed cancer patients for and optimising their health before starting acute treatments. New studies suggest that a multimodal approach that incorporates both physical and psychological prehabilitation interventions may be more effective than a unimodal approach that addresses just one or the other.

Three areas of focus form the basis of this guidance:

- Physical activity and exercise
- Nutrition
- Psychological support and behaviour change

These areas are set within a framework of screening, assessment and interventions. Interventions are defined at three levels: universal (suitable for all those with cancer), targeted (applicable to people with a cancer diagnosis with acute chronic or latent adverse effects of disease or treatment) and specialist (Applicable to those who have complex needs, severe impairment and/or disability). Monitoring, evaluation and on-going quality improvement of the interventions provided is also described.

The workforce to deliver the intervention is explained along with practical guidance about how to consider planning and delivering a service which includes prehabilitation interventions.

Prehabilitation as part of the rehabilitation pathway aligns strongly with Macmillan's long-term ambitions. Furthermore, the underlying principles, including ensuring personalised Holistic Needs Assessment and care planning is offered around time of diagnosis and through treatment phases, supported self-management, joint decision making and integrated care. This approach has been adopted in recognition of the increasingly complex health and care landscape, that 70% of people with cancer have other long term conditions to manage alongside cancer, changes in treatment options and delivery models meaning people may have continuing treatment for longer periods and more complex side effects; with newer treatments such as immunotherapy delivered in a community setting.

The aims of these guidance principles and guidance are to advance cancer care provision, inform and support a change policy, inform service provision, and change practice and behaviour for the benefit of people living with cancer and to ensure prehabilitation is understood and included in the development of cancer services as part of the whole cancer pathway.

## Royal College of Anaesthetists

**Professor Ravi Mahajan, President**

I am delighted to bring you this principles and guidance document developed in partnership with the Macmillan Cancer Support and the National Institute for Health Research Cancer and Nutrition Collaboration.

Prehabilitation offers three valuable opportunities to people living with cancer: empowerment, resilience and the potential for long-term health impact. As a Consultant Anaesthetist working in Nottingham, my patients have told me that they value how prehabilitation offers them the opportunity to take control of their own care. We all see the improved resilience that prehabilitation brings, not only enabling more rapid recovery following treatment, but on occasions opening the possibility of receiving treatments that were previously out of reach. The potential value of long-term behavioural change and the positive health impact this change may deliver is enticing to all involved – patients and professionals alike.

The Royal College of Anaesthetists (RCoA) has led the field of prehabilitation before cancer surgery for many years. We continue to support research outputs in this area and our perioperative medicine programme is now being delivered through the multi-specialty, multi-professional national Centre for Perioperative Care (CPOC) in the UK. The RCoA welcomes the opportunity to work alongside like-minded partners who share our aims of moving this field forward for the benefit of patients.

Prehabilitation, involving physical and psychological interventions, aligns with NHS England's Long Term Plan. Prehabilitation is a pathway-based intervention with a focus on prevention. Delivery is critically dependent on the effective integration between community, primary and secondary care. This guidance document offers a needs-based framework of screening, assessment and intervention (universal, targeted and specialist). Importantly, it also provides recommendations in relation to service redesign, workforce, quality assurance and improvement, clinical leadership and research.

I look forward to my team working with Macmillan Cancer Support and the National Institute for Health Research Cancer and Nutrition Collaboration as well as partners across the health and social care spectrum to deliver the vision set out in this document. This document provides guidance to people living with cancer, care providers, commissioners and policy makers. I hope that you will join us in working to deliver the vision set out here and I commend this document and action plan to you.

## National Institute of Health Research

**Dr Lucy Allen, Head of Collaborations, National Office of Clinical Research Infrastructure (NOCRI), National Institute of Health Research**

I am delighted to bring you this principles and guidance document developed in partnership with the Macmillan Cancer Support and the National Institute for Health Research Cancer and Nutrition Collaboration.

On receiving a diagnosis, people with cancer face many challenges. For some, the cancer may already have affected their physical and nutritional state, and their psychological well being before treatment starts. Individually and collectively, such changes can decrease resilience to the cancer and affect the response to surgery or systemic anti-cancer treatment. Put simply, being physically, nutritionally and psychologically 'unfit' is associated with increased risks and complications during treatment. The challenge therefore is to identify those who are at risk and prepare them ahead of their treatment in an attempt to reduce their risks and complications, and improve their response to treatment.

From a nutritional perspective, we have known for many years that those who have already lost weight or are at risk of becoming malnourished will do worse. There is strong evidence that they will benefit from nutritional support, and this is reflected in NICE guidance. There is now emerging evidence that structured exercise training and addressing the psychological needs of people prior to treatment can yield similar benefits.

However, not all people with cancer are affected in the same way and their needs may differ. The expectations from both patients and service providers to make these opportunities more widely available requires that we are clear about what we now know where the evidence is secure whilst also acknowledging where there is uncertainty and where more research is needed.

The NIHR Cancer and Nutrition Collaboration are very pleased to have worked with the Royal College of Anaesthetists and Macmillan Cancer Support to carefully consider the evidence and current experience in order to identify the principles that underlie safe and effective guidance on prehabilitation that minimises harm and offers greatest benefit to patients. We are committed to continue to work together to generate the evidence needed to inform our understanding of risk, resilience and response to cancer and so play our part in developing services for people with cancer.

# Executive summary

## Introduction

During 2017 Macmillan Cancer Support developed a strategic “Evidence and Insight Review” on prehabilitation with a focus on cancer in collaboration with internal and external stakeholders.

As an output of that review, it was agreed that prehabilitation should be incorporated into routine cancer care and that there was a need to develop **principles and guidance for prehabilitation within the management and support of people with cancer**.

We have developed these principles and guidance in partnership with the Royal College of Anaesthetists and the National Institute for Health Research Cancer and Nutrition Collaboration.

Prehabilitation offers people with cancer and their care givers three main benefits:

- **Personal empowerment**: Fostering a **sense of control and purpose** in people, facilitating preparation for treatment and **improving quality of life**.
- **Physical and psychological resilience**: An opportunity to improve physiological function and psychological wellbeing, thereby **improving resilience to the effects of cancer treatments, enhancing the quality of recovery** and enabling the **living of life as fully as possible** before, during and after treatment.
- **Long-term health**: An opportunity to reflect on the role of healthy lifestyle practices following a cancer diagnosis, promote **positive health behaviour change** and thereby **impact long-term health**.

# What is the purpose of prehabilitation for people with a cancer diagnosis?

Prehabilitation enables people with cancer to prepare for treatment through promoting healthy behaviours and through needs based prescribing of exercise, nutrition and psychological interventions. Prehabilitation is part of a continuum to rehabilitation. The aims of prehabilitation are to empower patients to maximise resilience to treatment and improve long-term health.

Prehabilitation can:

reduce length of stay

improve cardiorespiratory fitness

enhance recovery following treatment

improve nutritional status

reduce post treatment complications

improve aspects of neuro-cognitive function

provide a teachable moment to enable smoking and alcohol cessation

enhance quality of life

The benefits of prehabilitation can be seen in as little as two weeks[1]. Prehabilitation empowers people with cancer to enhance their own physical and mental health and well-being and thereby supports them to live life as fully as they can.

## Prehabilitation principles

1 Prehabilitation enables people with cancer to prepare for treatment by promoting healthy behaviours in order to maximise resilience to treatment and improve long-term health. Prehabilitation empowers people with cancer to enhance their own physical and mental health and well-being and thereby supports them to live life as fully as they can.

2 People are less vulnerable to the side effects of cancer treatment if they are as healthy as possible, physically and psychologically. People with cancer who have poor physical and/or mental health are known to have less treatment options available, to be more vulnerable to the adverse effects of cancer treatments, and to have poor long-term health prospects irrespective of cancer type and stage of disease.

3 Appropriately targeted interventions aimed at improving physical and/or mental health (exercise, nutrition and psychological interventions) along with behavioural change techniques are safe, accepted and welcomed by people with cancer and promote quality of life. A growing body of evidence suggests that they may also reduce side effects of treatment. Prehabilitation may, in some cases, allow people with cancer to access treatments that were not previously available to them.

4 Prehabilitation sits within a broader context of health improvement for people with cancer, including smoking and alcohol cessation, medication review, and management of long-term conditions, that we have not considered within the scope of this guidance.

## Prehabilitation in the cancer care pathway

5 Prehabilitation, as a component of rehabilitation, should underpin the whole cancer pathway and is an approach we seek for all people with cancer through co-developing a personalised prehabilitation care plan (PPCP) as part of their overall care plan. Prehabilitation can optimise cancer treatment by promoting health and well-being as part of a continuum of preventative, restorative, supportive and palliative rehabilitation interventions. Prehabilitation, specifically including exercise, nutrition and psychological support, should be integral to the care of all people with a cancer diagnosis.

6 All cancer treatments are led through cancer multidisciplinary teams (MDT). The cancer MDT should have representation from those delivering prehabilitation therefore providing oversight of the prehabilitation needs of the person to ensure prehabilitation is taking place. Community hub MDTs also have an important role to play in supporting people with cancer with physical activity and exercise, nutrition and psychological support. This will be in collaboration with specialist, hospital based oncology teams.

7 Personalised prehabilitation care plans (PPCP), as part of a person's care plan, should be a document that encompasses nutrition, physical and psychological screening for all people with cancer to identify need for more detailed assessment, individualised assessment according to need, and an individualised intervention prescription based on the screening and assessment process along with on-going support and evaluation to aid uptake and adherence.

8 Interventions targeted at improving physical and/or mental health **should start as early as possible** and in advance of any cancer treatment (not just the first cancer treatment).

## Screening

**9** Identification of people with cancer requiring prehabilitation (ie screening) should occur as early as possible from diagnosis (and in some cases before a confirmed diagnosis), and in advance of each treatment. Screening should use validated tools to identify the need for more detailed assessment in order to inform the prescription of targeted or specialist interventions. Screening should be aligned to the Holistic Needs Assessment (HNA) and should include psychological risk factors, physical fitness and nutrition including evaluation of weight loss, poor intake, body mass index and nutrition impact symptoms.

## Assessment

**10** Individualised assessment, when indicated, should encompass comprehensive evaluation of needs identified during screening using validated clinical measurement techniques. Assessments should inform the individualised prescription of exercise, nutrition and psychological interventions.

## Intervention

**11** Interventions should be categorised into universal, targeted and specialist:

**A. Universal interventions**
Universal interventions are applicable to anyone with cancer. People with cancer and their families, should receive dietary, exercise and psychological advice and behaviour change support, be sign-posted to appropriate resources, and be advised on how to self-manage, recognise and respond to any change in physical and/or psychological state. People with cancer receiving targeted and specialist interventions in particular areas will also require advice, support and signposting in areas where they are not receiving targeted/ specialist interventions.

**B. Targeted interventions**
Targeted interventions are applicable to those people with cancer with and at risk of late effects of disease or treatment and those with other long-term conditions. Specific needs identified during screening should be addressed with prescribed exercise, nutrition and psychological interventions and behaviour change support by a registered health and care professional according to need. Adherence and effectiveness should be monitored.

**C. Specialist interventions**
Specialist interventions are applicable to people with cancer who have complex needs, complex treatment eg major surgery, severe impairment and/or disability and will need referral to registered professionals to prescribe exercise, nutrition and psychological interventions and behaviour change support according to need. Adherence and effectiveness should be monitored.

**Contraindications to exercise**
There should be caution where cancer has spread to bone and during treatment associated with reduced immunity or reduction in normal blood counts. In these situations the advice of the oncology team should be sought[2,3,4].

## Monitoring and evaulation

**12** Monitoring of interventions should be proportionate to need. Universal interventions should be self-monitored and recorded via the HNA or equivalent process. Targeted and specialist interventions should be monitored for adherence and effectiveness using appropriate validated measures.

## Service development

**13** Prehabilitation is a means of transforming patient care to achieve sustainable high-quality services within the current mandated performance framework[5,6,7]. The principal focus should be on optimising the efficiency and timeliness of current pathways from the moment of consideration of treatment onwards, without unnecessarily delaying scheduled treatment (patients best interests should be considered on a case by case basis and this may, in some circumstance, result in delaying treatment).

14 People with cancer as well as carers, relatives and a person's wider network should be supported to engage with and adhere to available prehabilitation services defined by a jointly agreed PPCP.

15 Services delivering prehabilitation should be co-designed and produced with patients and carers.

## 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 universal interventions, may be self-managed.
- Assessment and prescription (of targeted and specialist interventions) should be undertaken by registered health and care professionals.
- Universal interventions may be self-delivered or supported by any health and care professional.
- Targeted interventions may be delivered by registered health and care professionals or by unregistered staff under delegated authority.
- Specialist intervention should be delivered by registered health and care professionals.

## Quality assurance and improvement

17 Implementation and effectiveness should be audited as part of a quality assurance and improvement framework delivered and reported according to recognised standards. A set of standardised screening, assessment, adherence, efficacy, experience and outcome measures should 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.

## Developing the evidence base

19 Prehabilitation interventions should be underpinned by theory and evidence. Evidence should be drawn from across the spectrum of investigation including discovery science, experimental medicine, clinical investigation, population science and implementation science as well as from quality assurance and improvement data. A gap analysis of current evidence should identify unanswered questions and inform future research priorities.

20 Evidence should be carefully, critically and systematically appraised, in the context of current experience, so that safe and effective guidance on prehabilitation can be refined and improved in order to minimise risk/harm and offer greatest benefit to patients.

## Action plan

The following is a proposed action plan for service providers, commissioners and researchers that has been identified as a result of the development of this document.

Clinical leadership and advocacy is essential for the spread and adoption of these principles and guidance, the delivery of this action plan, and the further development of prehabilitation for people with cancer.

1. **Integrate prehabilitation into the established clinical pathways for people with cancer, including integration of screening questions into holistic needs assessments (including the Macmillan Holistic Needs Assessment), inclusion of the interventions into treatment summaries where appropriate and follow-up and monitoring by primary care providers managing cancer as a long term condition.**
2. **Gather examples of how local areas have had prehabilitation commissioned as part of the cancer pathway.**
3. **Gather examples of personalised prehabilitation care plans (PPCP).**
4. **Develop a 'Community of Practice' resource to provide contacts of local/ regional sites and share expertise and learning from established prehabilitation programmes.**
5. **Work with relevant registered and unregistered professional groups to define a competence and training framework for professionals in prehabilitation.**
6. **Work with the Professional Standards Authority (PSA), the Chartered Institute for the Management of Sport and Physical Activity (CIMPSA) and the British Association of Sport and Exercise Sciences (BASES) to define an approach to achieving accreditation and/or regulation for exercise professionals in prehabilitation.**
7. **Develop a quality assurance and quality improvement framework and advocate for the inclusion of relevant data in established national audits.**
8. **Develop a standardised set of validated screening, assessment, adherence, efficacy and outcome measures.**
9. **Conduct a gap analysis of current evidence to identify future research priorities and maintain this resource.**
10. **Pursue a prehabilitation research agenda in partnership with relevant stakeholders including: National Institute for Health Research (NIHR), Cancer Research UK (CR-UK) and the National Cancer Research Institute (NCRI).**
11. **Pursue the health economic evaluation of prehabilitation programmes to inform the development of viable business cases for prehabilitation. The health economics evaluation should take account of short- (eg tolerance of treatment) and long- (eg healthy behaviours resulting in improved long-term health) term outcomes.**

# 1. Introduction

During 2017 Macmillan Cancer Support developed a strategic "Evidence and Insight Review"[8] on prehabilitation with a focus on cancer in collaboration with internal and external stakeholders.

As an output of that review, it was agreed that prehabilitation should be incorporated into routine cancer care and there was a need to develop **principles and guidance for prehabilitation within the management and support of people with cancer**.

This document addresses that need and has been prepared through a five stage process involving 1) definition of scope, questions and participants; 2) evidence synthesis; 3) multidisciplinary expert group consensus development; 4) synthesis of expert group outputs through a structured thematic prioritisation; 5) development and refinement of the Principles and Guidance document through iterative peer review by a multi-disciplinary team of more than 100 contributors. At every stage people with cancer and those that care for them have been involved.

This document is aimed at health and care professionals providing services as well as policymakers, health and care leaders and commissioners of services. It will hopefully also provide valuable information for people living with cancer and those near to them. The aims of the document are to:

- Influence national, regional and local policy driving the provision of care
- Educate patients, healthcare providers, commissioners and academics
- Change practice and behaviour

These **principles and guidance** endorse the benefits of prehabilitation to patients facing a diagnosis of cancer and the prospect of treatment. For some patients treatment may be surgery alone, whilst for others this treatment entails a prolonged period of radiotherapy, and/or systemic anti-cancer therapy (SACT) (eg chemotherapy, immunotherapy), sometimes in sequence, and stretching over many months or even years.

Our hope is that these principles and guidance balance ambition and realism: we all wish to improve the care of people with cancer however we must do this within the inevitable constraints of the available evidence and the available resources with the NHS system within which we work.

# What is the purpose of prehabilitation for people with a cancer diagnosis?

Prehabilitation enables people with cancer to prepare for treatment through promoting healthy behaviours and through needs based prescribing of exercise, nutrition and psychological interventions. Prehabilitation is part of a continuum to rehabilitation. The aims of prehabilitation are to empower patients to maximise resilience to treatment and improve long-term health.

Prehabilitation can:

reduce length of stay

improve cardiorespiratory fitness

enhance recovery following treatment

improve nutritional status

reduce post treatment complications

improve aspects of neuro-cognitive function

provide a teachable moment to enable smoking and alcohol cessation

enhance quality of life

The benefits of prehabilitation can be seen in as little as two weeks[1]. Prehabilitation empowers people with cancer to enhance their own physical and mental health and well-being and thereby supports them to live life as fully as they can.

**Evidence to support the benefits of prehabilitation from systematic reviews and meta analyses include the following:**

***"Psychological-based prehabilitation with standard care yielded better outcomes than standard care alone. Psychological-based prehabilitation provides evidence in its effectiveness to reduce psychological distress, functional impairment, recurrence of cancer, numbers of immune reactivity and sleeping quality."***

Y. Chen; M. Ahmad (2018) Effectiveness of adjunct psychotherapy for cancer treatment: a review. Future Oncology. Vol. 14. Issue 15. Pp 1487–1496.

***"Prehabilitation consisting of inspiratory muscle training, aerobic exercise, and/or resistance training can decrease all types of postoperative complications after intra-abdominal operations."***

J. Moran; E. Guinan; P. McCormick; J. Larkin; D. Mockler; J. Hussey; J. Moriarty; F. Wilson (2016) The ability of prehabilitation to influence postoperative outcome after intra-abdominal operation: A systematic review and meta-analysis. Surgery. Vol. 160. Issue 5. Pp 1189–1201.

***"Patient counselling, physical conditioning, avoiding excessive alcohol and smoking, and good nutrition appeared to protect against postoperative complications. Restricted, balanced, and goal-directed fluid replacement is effective when individualised, depending on patient morbidity and surgical procedure. Decreased intraoperative blood loss may be achieved by several measures. Deep vein thrombosis prophylaxis, antibiotic prophylaxis, and thermoregulation were found to help reduce postsurgical complications, as was a multimodal approach to postoperative nausea, vomiting, and analgesia. Chewing gum, prokinetic agents, oral laxatives, and an early resumption to normal diet appear to aid faster return to normal bowel function."***

R. A. Azhar; B. Bochner; J. Catto; A. C. Goh; J. Kelly; H. D. Patel; R. S. Pruthi; G. N. Thalmann; M. Desai (2016) Enhanced Recovery after Urological Surgery: A Contemporary Systematic Review of Outcomes, Key Elements, and Research Needs. European Urology. Vol. 70, issue 1 pp 176–87.

***"Presurgical interventions based on moderate-to-intense aerobic exercise in patients undergoing lung resection for lung cancer improve functional capacity and reduce postoperative morbidity, whereas interventions performed only during the postoperative period do not seem to reduce PPCs or LOS."***

A. Rodriguez-Larrad; I. Lascurain-Aguirrebena; L. C. Abecia-Inchaurregui; J. Seco (2014) Perioperative physiotherapy in patients undergoing lung cancer resection. Interactive Cardiovascular and Thoracic Surgery. Vol. 19. Issue 2. Pp. 269–281.

***"Preliminary work from this review suggests that exercise intervention compared with usual care both pre and post-surgery is associated with improved cardiopulmonary exercise capacity, increased muscle strength and reduced fatigue, post-operative complications and hospital length of stay."***

K. Crandall; R. Maguire; A. Campbell; N. Kearney (2014) Exercise intervention for patients surgically treated for Non-Small Cell Lung Cancer (NSCLC): A systematic review. Surgical Oncology-Oxford. Vol. 23. Issue 1. Pp. 17–30.

***"Well-designed psychosocial intervention programmes that include follow-up can improve the outcomes of colorectal patients, including their length of hospital stay, days to stoma proficiency, hospital anxiety and depression, and quality of life."***

L. S. Hoon; C. W. C. Sally; H. Hong-Gu (2013) Effect of psychosocial interventions on outcomes of patients with colorectal cancer: A review of the literature. Vol. 17. Issue 6. 883–891.

***"Overall, the available evidence suggests that pre-surgical exercise through aerobic, resistance or pelvic floor training being prescribed on their own or in combination e can be beneficial for prostate, lung and colorectal cancer patients. Despite having substantial heterogeneity in participants, study designs and interventions among the reviewed studies, pre-surgical exercise protocols involving either aerobic or resistance training have resulted in functional and clinical benefits that are critically important in cancer care. Pre-surgical exercise interventions have been found to not only improve aerobic fitness and muscle strength in studies of patients with cancers of the abdominal area, but also reduce the rate and duration of continence in prostatectomy patients."***

F. Singh; R. U. Newton; D. A. Galvao; N. Spry; M. K. Baker (2013) A systematic review of pre-surgical exercise intervention studies with cancer patient. Surgical Oncology-Oxford. Vol. 22. Issue 2. Pp 92–104.

## Non-surgical patients

***"Resistance exercise (RE) increases muscle strength, maintains lean body mass (LBM), and reduces body fat (BF) in cancer patients undergoing adjuvant and neoadjuvant therapies. Cancer patients and survivors should consider undertaking RE as an effective countermeasure for treatment-related adverse effects to the musculoskeletal system."***

Padilha; P. C. Marinello; D. A. Galvao; R. U. Newton; F. H. Borges; F. Frajacomo; R. Deminice (2017) Evaluation of resistance training to improve muscular strength and body composition in cancer patients undergoing neoadjuvant and adjuvant therapy: a meta-analysis. Journal of Cancer Survivorship. Vol. 11, issue 3, pp. 339–349.

Prehabilitation offers people with cancer and their care givers:

- **Personal empowerment**: Fostering a **sense of control and purpose** in people, facilitating preparation for treatment and **improving quality of life**.
- **Physical and psychological resilience**: An opportunity to improve physiological function and psychological wellbeing, thereby **improving resilience to the effects of cancer treatments, enhancing the quality of recovery** and enabling the **living of life as fully as possible** before, during and after treatment.
- **Long-term health**: An opportunity to reflect on the role of healthy lifestyle practices following a cancer diagnosis, promote **positive health behaviour change** and thereby **impact long-term health**.

The national cancer strategy 'Achieving World Class Cancer Outcomes'[9] for England recognised the importance of preparation for recovery and life beyond cancer for many people with cancer. This strategy mandated the introduction of the Recovery Package, a toolkit developed by Macmillan and comprised an HNA before and on completion of treatment leading to individualised care plans; a treatment summary; a cancer care review in primary care; and access to health and wellbeing activities. This is being implemented across all cancer alliances in England and across the devolved nations and will enable a transformation of current cancer follow-up towards a more flexible and personalised approach.

The principles of physical activity and exercise, good nutrition and psychological support are reinforced by the Recovery Package elements now in place. The NHS Long Term Plan[10] highlights elements of the Recovery Package[11] as personalised care and support. Self-efficacy, an individual's belief in their innate ability to achieve goals, and the capacity for people to manage their own condition is required to some degree.

It is acknowledged that this will be easier for some and less so for others. Different people will require different levels of support to help them to self-manage.

The benefits of prehabilitation in the UK have been demonstrated through programmes that have focussed on patients before cancer surgery. There is now evidence of both psychological and physiological improvements that are clearly relevant to improving resilience through longer programmes entailing systemic treatments and radiotherapy. It is recognised that the evidence of effectiveness of interventions is stronger in some areas than others, which is why the value of monitoring implementation, quality assurance and quality improvement is also highlighted. The importance of doing this within a standardised reporting framework is emphasised along with the need for standardisation of screening, assessment, adherence, efficacy and outcome measures. There are also gaps in the evidence, for example the effectiveness of multi-modal interventions, and these need to be systematically identified and addressed.

It is clear that those who represent people affected by cancer strongly welcome a prehabilitation approach from the very beginning of the cancer journey and have been part of shaping this guidance. The benefits of these principles and guidance for those commissioning, providing and receiving services is summarised in table 1.

**Table 1: Benefits of these principles and guidance for those commissioning providing and receiving services**

| Commissioning or providing services | Those people living with and affected by cancer |
|---|---|
| Provides a framework for the commissioning and delivery of prehabilitation within the management and support for people living with cancer. | |
| Describes the necessary components of prehabilitation for people living with cancer. | |
| Promotes equity of care through a standard set of principles. | |
| Helps inform commissioning contracts and specifications. | |
| Patient empowerment, promotes long term healthy behaviours (at a teachable moment). | |
| Stratified approach and different interventions helps map populations and associated service provision. | |
| Improves tolerance of cancer treatments. | |
| Improves quality of life. | |
| Enhance recovery. | |
| Reduces length of stay. | |
| Reduces treatment complications. | |
| Accelerates return to normal function. | |
| Uptake and adherence are high.[12] | |
| Provide a teachable moment to enable smoking and alcohol cessation. | |
| Enables people to have access and choice of treatments that might not otherwise be accessible to them. | |

***"Prepares for treatment in terms of physical and mental issues"***

***"Help in reducing anxiety and preparing for treatment"***

***"It makes you feel more in control of your treatment"***

***"Calmed the nerves and reassured me"***

***"Getting expert advice and talking to other in similar situation"***

***"Takes your mind off it all – something to focus on"***

***"Prehabilitation helps you pick, edit and contribute to your cancer story – so you have your own ownership and don't just feel you are being 'done to'"***

## Background

This principles and guidance for document has been developed and produced by a partnership formed between Macmillan Cancer Support, the Royal College of Anaesthetists (RCoA) and the National Institute for Health Research (NIHR) Cancer and Nutrition collaboration.

Macmillan Cancer Support is the largest cancer care and support charity in the UK. As well as helping with the medical needs of people living with cancer, Macmillan Cancer Support also provides social, emotional and practical support and campaigns for better cancer care. Macmillan Cancer Support is involved in shaping personalised cancer care and support nationally, for example through HNA Assessment, health and well-being support, treatment summaries and cancer care reviews.

The RCoA is the third largest Medical Royal College in the UK and represents the UK's largest hospital specialty: anaesthesia. The RCoA ensures quality of patient care by safeguarding standards in the three specialties of anaesthesia, intensive care and pain medicine and is the home of the national Centre for Perioperative Care[13]. Prehabilitation before surgery in general, and cancer surgery in particular, is a key priority for service development and research.

NIHR Cancer and Nutrition Collaboration seeks to bring greater coherence to the disciplines of cancer and nutrition, drawing on a wide range of skills and expertise that have hitherto not been well coordinated with limited sharing of knowledge, information and expertise between them[14].

## Aims

The aims of these principles and guidance are to advance cancer care provision, inform and support a change policy, inform service provision, practice and behaviour to the benefit of people living with cancer.

The three areas of focus in this guidance are:

- Physical activity and exercise
- Nutrition
- Psychological support and behaviour change

Effective prehabilitation for people living with cancer will involve integration of these three areas with each other and within cancer pathways. Multi-modal prehabilitation refers to the combination of these three areas into an integrated package of care delivered in a coordinated way.

## Scope

This guidance is applicable to those from 16 years[15] upwards with any cancer diagnosis including those being treated/ palliated with surgery and/or systemic anti-cancer therapy (SACT) and/or radiotherapy.

It should be noted that the majority of the evidence comes from those having surgery. However, it is proposed that these principles can be applied to those receiving systemic treatments.

The primary interventions encompassed by prehabilitation include tailored exercise (both cardiovascular fitness and resistance training as well as localised and/or targeted exercise such as respiratory exercise or pelvic floor strengthening), nutritional support and psychological support.

Optimisation of general health status including management of long-term conditions, smoking cessation, alcohol reduction, as well as management of transitions of care fall out with the scope of this document. These areas are important, nevertheless.

## Prehabilitation and rehabilitation

Rehabilitation is a central element of cancer care and a key theme of the Cancer Taskforce recommendations[16]. Prehabilitation is part of a continuum in the rehabilitation pathway (Figure 1). It enables people with cancer to make the most of their lives by maximising the outcomes of their treatment whilst minimising the consequences of treatment including symptoms such as fatigue, breathlessness and lymphoedema.

The need for prehabilitation, as part of the rehabilitation pathway, starts at the point of diagnosis (and in some cases before a confirmed diagnosis) helping patients prepare for treatment and discharge home. It can help patients get well and stay well and addresses the practical problems caused by the disease and treatment, helps patients become as independent as possible and minimise the impact on carers and support services[17].

**Figure 1 illustrates the relationship between prehabilitation and rehabilitation and the proposed difference in outcomes.**

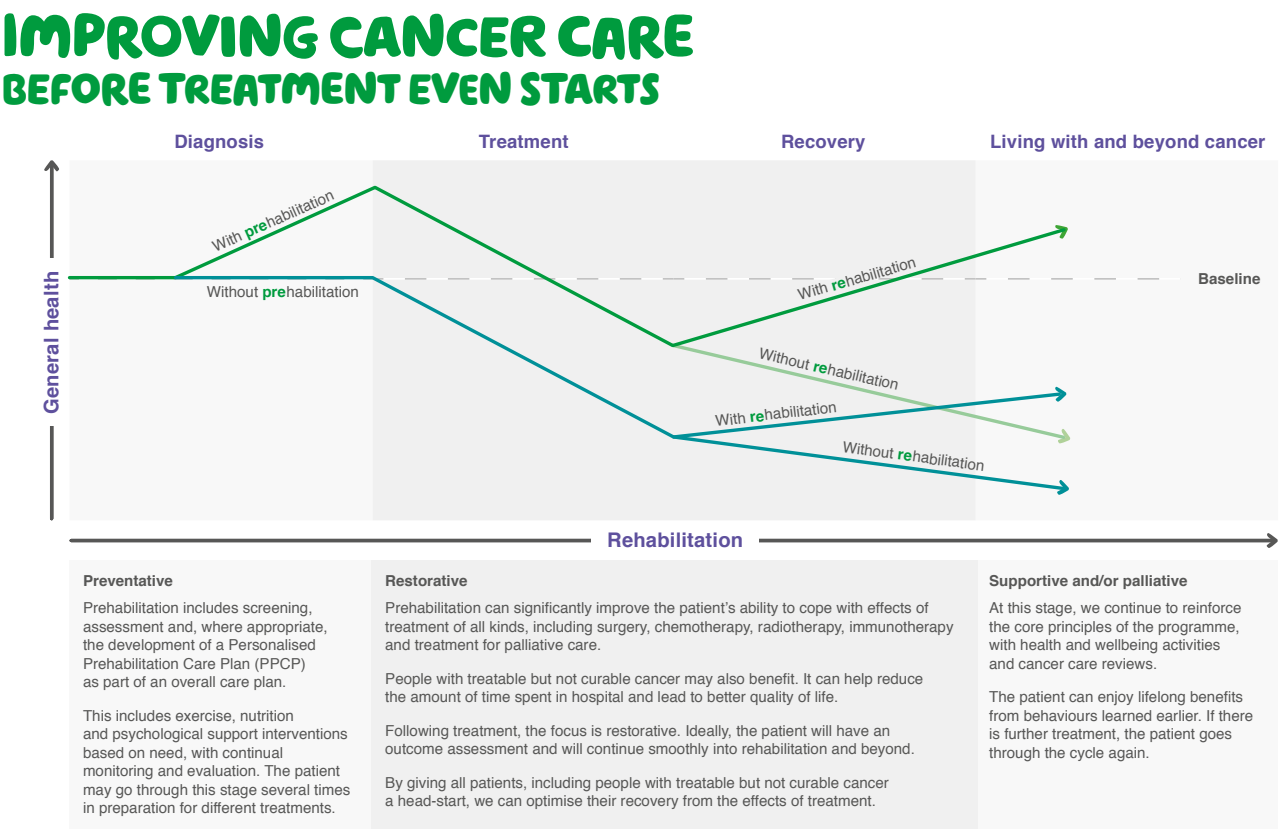


**Table 2: The current cancer pathway and how the pathway would look with prehabilitation included**

| Current pathway | New pathway with Prehabilitation included | Comments |
|---|---|---|
| Diagnosis | Prehabilitation begins at any point from diagnosis (and in some cases before a confirmed diagnosis), aiming to optimise a patient's health. | |
| Pre-treatment assessment | Screening for prehabilitation, assessment, care plan including a personalised prehabilitation care plan (PPCP) | Pre-treatment Holistic Needs Assessment (HNA) and care plan |
| | Where a patients needs are identified above a prehabilitation programme would be prescribed. | |
| Surgery | | |
| Recovery then follow up | | |
| | Prescribed prehabilitation then rehabilitation programme. | Rehabilitation where need identified. |
| Maintain benefits – into follow up and life beyond | Continue prehabilitation programme principles | Health and well-being activities<br>Cancer care reviews<br>Reinforce message, lifelong benefit |
| **Preceded or followed by** | | |
| Referral for systemic (chemotherapy, hormonal therapy, targeted drugs, immunotherapy)/ radiotherapy treatment | Screening, assessment, care plan including a personalised prehabilitation care plan (PPCP) | Treatment to start within 31 days of cancer diagnosis which includes initial outpatient consultation |
| Treatment preparation | Where need identified above prescribed prehabilitation programme | Constrained time frame<br>Note some patients have high disease/symptom burden and poor performance status |
| During treatment | Prescribed prehabilitation programme continues | |
| Preparation for recovery | Outcome assessment | In conjunction with the post-treatment HNA and care plan and treatment summary |
| Maintain benefits – into follow up and life beyond | Continue prehabilitation programme principles | Health and well-being activities<br>Cancer care reviews<br>Reinforce message, lifelong benefit |

# 2. Context

Cancer and its treatment can affect all aspects of life, including personal wellbeing and family life. As a result, people living with cancer may need support with some or all of the following: physical, practical, self-care, emotional and psychological, spiritual and religious needs and those related to finances, work and education. Macmillan estimates around one in four (25%) people living with and beyond cancer have one or more physical or psychosocial consequences of their cancer or its treatment that affects their lives on a long term basis[18].

As more people survive with cancer for longer, pre-treatment intervention can help mitigate impairment and promote wellbeing to enable those affected to live as they would like. Every person with cancer is different and support should be tailored to individual needs.

## The changing nature of cancer in the UK

The changing nature of cancer means that 5.3 million people in the UK will be living with cancer by 2040 with an average survival of ten years or more. This includes individuals with treatable but not curable cancer and those who have one or more long-term health conditions, which may be as a result of cancer and/or its treatment.

The number of people living with cancer in the UK is increasing by 3% every year[19].

The latest officially published incidence figures for the UK are for 2016 and tell us over 360,000 people are diagnosed with cancer every year[20].

Thanks to advances in treatment, people are now living longer with a cancer diagnosis than ever before, with the number of people surviving for five or more years after diagnosis rising by over 260,000 (or 21%) in the five years to 2015[21]. This trend is expected to continue.

## Cancer and public health policy: the NHS Long-Term Plan in England

The focus on early cancer diagnosis, increasing prevalence and genetic profiling provides a greater focus for prehabilitation in cancer care. Prehabilitation closely aligns with many elements of the NHS England Long-Term Plan (LTP) including personalised care, screening and early diagnosis, tackling health inequalities and maximising value. Enablers to support the delivery of prehabilitation include supporting the health and care workforce and making effective use of data and digital technology.

## Prehabilitation and the NHS Long Term Plan: alignment of purpose

**Personalised Care**
Empowering people living with cancer to take control of their care builds on a dominant theme within the LTP and is a strong and consistent wish expressed by people living with cancer as depicted in the quotes overleaf.

HNA, a personalised care plan, treatment summaries shared with primary care and health and wellbeing provision are all important components of a comprehensive model for personalised prehabilitation care.

**Integration of care**
Prehabilitation delivered across primary, secondary and social care promotes integration and communication. There are 44 sustainability and transformation partnerships (STPs) in England. Cancer alliances may map across to one or more STPs. Going forward, primary care networks[22] and community multidisciplinary teams will be an important enabler to support the delivery of prehabilitation. Based on their individual needs and choices, people identified as having the greatest risks and needs will be offered targeted support for both their physical and mental health needs, which will include musculoskeletal conditions, cardiovascular disease, dementia and frailty.

*"I would really like to see workshops and seminars for patients undergoing similar treatments explaining the impacts of treatment and how best to manage these."*

*"…there needs to be a personal health plan…"*

*"Every patient is different, and their needs to…"*

*"People need to be mentally, physically and emotionally as ready as possible to face the challenge of cancer in their own chosen way."*

**Screening, early diagnosis and prevention**
Personalised, risk stratified screening and early diagnosis of primary and recurrent cancer is a key national health priority. The same priorities are vitally important in relation to prehabilitation once a cancer diagnosis has been made. Large-scale observational studies[23] strongly suggest that prehabilitation should be considered as secondary prevention for cancer. Prehabilitation aligns with public health messages on healthy eating, physical activity and exercise as well as smoking and alcohol cessation.

**Inequality**
There is wide disparity across the UK in the availability of prehabilitation for people living with cancer (section 3). Moreover, smoking, alcohol consumption, and obesity – which increase the risk of the development of cancer and other long-term conditions – are closely related to the social determinants of health which in turn are in part geographically determined. Barriers to high quality, personalised care for socio-economically deprived people include poorer conversations with health and care professionals, less involvement in decisions about care and treatment and less support after treatment from community and social providers[24].

**Getting the most out of taxpayers investment in the NHS**
Prehabilitation adds value through reducing short-term harm and resource use as well as potentially improving long-term behaviour and health. This maps onto the Getting It Right First Time (GIRFT) initiative across surgery and perioperative care[25].

Health economic data should continue to be collected and evaluated about prehabilitation programmes.

## Enablers to support delivery of prehabilitation within the NHS Long Term Plan

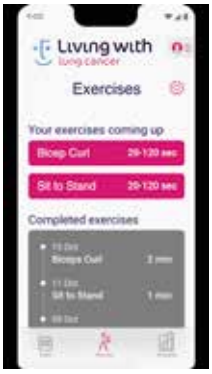
### Workforce

Effective delivery of prehabilitation is dependent on a multi-professional team approach involving registered and unregistered health and care professionals and those working in the wider community. Credentialing, regulation and/or registration at an appropriate level, along with effective integration of prehabilitation concepts into the undergraduate and postgraduate education and training of all health and care professionals is important. Health and care professionals should be encouraged to lead service transformation in cancer care to support early intervention after diagnosis.

### Making better use of data and digital technology

There are excellent examples of APPs and web-based self-management portals that are supporting people living with cancer to manage their own health and well-being as part of prehabilitation initiatives across the UK eg ERAS plus developed in Greater Manchester, Living With Lung Cancer digital platform developed by Bart's Health NHS Trust, mySurgery developed by University Hospital Southampton and my-mhealth. There is a need to continue to look for the most effective ways of engaging with digital technology. Some APPs may increase anxiety rather than reduce it so this may not be the best solution for everyone.

Effective use of data, for example trigger questions embedded in the HNA and the service improvement benchmarking tools for cancer rehabilitation, will be important for quality assurance and improvement as prehabilitation develops.




## Policy in the devolved UK nations

In Wales pre-treatment health optimisation and prehabilitation are explicitly mentioned in the Cancer Delivery Plan for Wales 2016-2020[26]. This gives Wales the greatest policy opportunity of the UK nations widespread prehabilitation delivery. Aligned to this is the Macmillan Primary Care for Cancer framework[27]. This framework spans from initial consultation, referral and through to diagnosis and treatment and beyond. Pre-treatment health optimisation in primary care optimisation at the point of referral for cancer investigation is a key aspect of this framework following a recently published study[28]. At the time of print, discussions are ongoing with Welsh Government about long term sustainable prehabilitation delivery and funding.

Scotland's policy document Beating Cancer[29] provides possible levers for prehabilitation in the areas of post-treatment support and healthy lifestyles. Furthermore, NHS Scotland published 'New public health priorities for a healthier nation' in 2018[30] that include several priorities including health eating and physical activity and mental wellbeing.

Northern Ireland's most recent cancer policy document is from 2011 and does not explicitly mentions prehabilitation, but highlights some potential levers around healthy lifestyles, eg physical activity, health eating, alcohol consumption. The Chief Nursing Officer for Northern Ireland is currently leading the development of a new 10 year cancer strategy[31].

# 3. Prehabilitation in practice

Prehabilitation services for people living with cancer are developing rapidly across the UK.

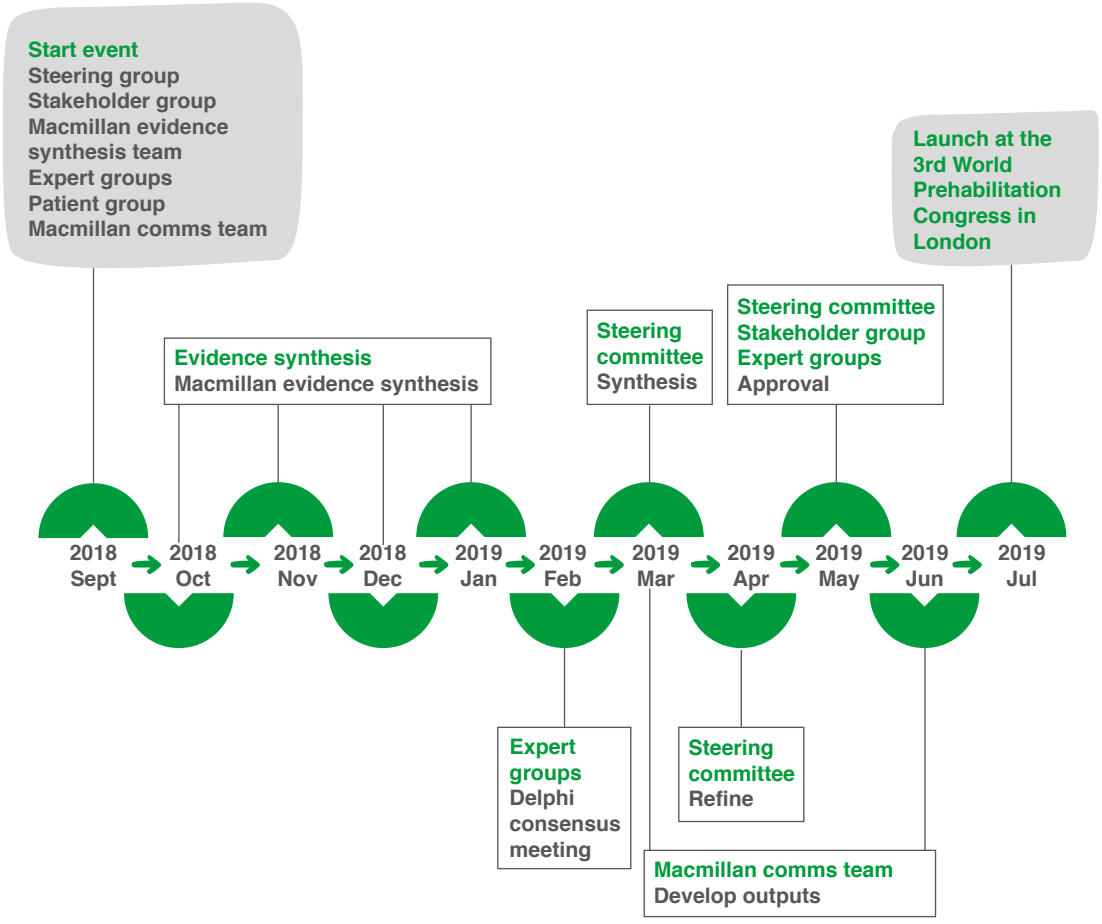
The number of clinical trials, implementation and service transformation projects is rapidly expanding which is leading to the development of an ever-growing multi-professional community of expert providers.

**Map of some prehabilitation services and evaluations for people living with cancer across the UK**

1. **Lung cancer Prehab programme**
   Barts Thorax Centre, Barts Health NHS Trust Centre, Barts Health NHS Trust
   https://bartshealth.nhs.uk
2. **Prehabilitation offered based on referral**
   Royal Marsden NHS Foundation Trust
   www.royalmarsden.nhs.uk
3. **PREPARE programme**
   Imperial College Healthcare NHS Trust
   www.imperial.nhs.uk/our-services/cancer-services/oesophago-gastric-cancer/prepare-programme
4. **Kent and Medway Maritime Prehabilitation Team**
   Medway NHS Foundation Trust
   www.medway.nhs.uk
5. **WESFIT – Wessex fit 4 cancer surgery trial**
   University Hospital Southampton NHS Foundation Trust
   http://wesfit.org.uk
6. **Prehabilitation services**
   Bristol
   https://www.uhbristol.nhs.uk/patients-and-visitors/preparing-to-come-to-hospital/preparing-for-surgery/
7. **Pre-optimisation and prehabilitation programme (POP)**
   Wales
   https://research.publichealthnetwork.cymru/files/7715/2104/3946/003_Rachael_Barlow.pdf
8. **PREPARE ABC**
   Norwich
   www.uea.ac.uk/prepare-abc
9. **Aintree prehabilitation service** Aintree University Hospital NHS Foundation Trust
   www.csp.org.uk/frontline/article/cancer-prehab-fit-surgery
10. **ERAS + and Prehab4cancer**
    **Greater Manchester**
    GM Cancer NHS Foundation Trust
    www.erasplus.co.uk
    https://gmcancer.org.uk/our-areas-of-work/prehab4cancer
11. **PREPWELL** South Tees Hospitals NHS Foundation Trust
    www.southtees.nhs.uk/services/prepwell-project
12. **NIPI** Newcastle Upon Tyne Hospitals NHS Foundation Trust
    www.newcastle-hospitals.org.uk
13. **Prehabilitation in colorectal patients**
    Glasgow
    www.cancerpreventionscotland.org.uk/newsletter/expert-insight-5
14. **Prehabilitation in prostate cancer**
    Belfast Hospital NHS Trust
    www.csp.org.uk/news/2016-09-29-belfast-physios-use-prehab-improve-quality-life-men-prostate-cancer

# 4. Methods used in the development of this guidance

The Principles and Guidance have been prepared through a five stage process involving 1) definition of scope, questions and participants; 2) evidence synthesis; 3) multidisciplinary expert group consensus development; 4) synthesis of expert group outputs through a structured thematic prioritisation; 5) development and refinement of the Principles and Guidance document with iterative peer review by a multi-disciplinary team of more than 100 contributors. At every stage people with cancer and those that care for them have been involved.



## Stage 1: Scoping and preparation

Scoping commenced in May 2018 with project initiation in July 2018. This Principles and Guidance document was launched on 2nd July 2019. The initial scoping period defined the five stage process and the key contributor groups: steering group, stakeholder group, three expert groups, patient group, and evidence synthesis team.

Membership of each group is listed in Appendix 1. A detailed description of each stage of the Principles and Guidance preparation process along with the roles of each group are described in a separate manuscript detailing the methods used in this process.

## Stage 2: Evidence synthesis

The Macmillan Evidence Synthesis Team conducted a comprehensive evidence synthesis based on the framework and questions prepared by the three expert groups during the scoping and development phase. This involved searching electronic databases to identify relevant primary (clinical trials) and secondary (systematic reviews) sources and data extraction from these resources according to a standardised approach.

## Stage 3: Expert group consensus process

The three expert groups each comprised 10–12 contributors with a representative from each of the following categories of contributor: oncologist, surgeon, anaesthetist, relevant allied health professionals (dietitian, physiotherapist) and other health and care professionals (clinical exercise physiologist, clinical psychologist), international expert, early career scientist, and lay/patient member. Drawing on the evidence synthesis, internationally recognised consensus methods, based on modified Delphi techniques, were used to develop consensus-based outputs in the following three categories: consensus statements, recommendations, research questions. The GRADE system was used to categorise the quality of evidence and strength of recommendations.

## Stage 4: Synthesis of expert group outputs by stakeholder and steering groups

The stakeholder and steering group, meeting together, reviewed the outputs of each expert group with the aim of placing them into the context of patient experience and NHS care and identifying core themes and recommendations. This synthesis formed the basis of the Principles and Guidance document.

## Stage 5: Preparation and approval of Principles and Guidance

The Principles and Guidance document was then iteratively developed and refined by the joint project leads with repeated review and commentary form the steering group, stakeholder group and expert groups. The final draft was approved by the steering group.

# 5. Principles of prehabilitation in people with a cancer diagnosis

**1** Prehabilitation enables people with cancer to prepare for treatment through promoting healthy behaviours in order to maximise resilience to treatment and improve long term health. Prehabilitation empowers people with cancer to enhance their own physical and mental health and well-being and thereby support them to live life as fully as they can.

**2** People are less vulnerable to the side effects of cancer treatment if they are as healthy as possible, physically and psychologically. People with cancer who have poor physical and/or mental health are known to have less treatment options available, to be more vulnerable to the adverse effects of cancer treatments and to have poor long-term health prospects irrespective of cancer type and stage of disease.

## Impact of poor fitness levels on outcomes

Evidence from epidemiological studies indicate that being physically active after a cancer diagnosis is associated with increased survival time and reduced risk of disease progression[32].

Poor cardiorespiratory fitness after a cancer diagnosis is associated with a higher prevalence of acute and chronic treatment-related toxicities such as cardiovascular morbidity[33,34] (NB it is common practice to dose reduce a cardiotoxic chemotherapy drug if there is a history of cardiovascular disease), higher symptom burden eg poor health-related quality of life, fatigue[35,36] and increased risk of all-cause and cancer-specific mortality[37,38].

## Impact of poor mental health on outcomes

Survival after a cancer diagnosis is reduced in people with pre-existing severe mental illness with mortality risk 90% higher in patients with schizophrenia and 20% higher in patients with prior depression[39].

Psychosocial factors including self-efficacy, an individual's belief in their innate ability to achieve goals, and depression before surgery predict recovery trajectories in quality of life, health status and wellbeing following colorectal cancer treatment independent of treatment or disease characteristics[40]. This has significant implications for colorectal cancer management as appropriate support may be improved by early intervention resulting in more positive recovery experiences[40]. A large prospective cohort study demonstrating that depression and self-efficacy at baseline (prior to treatment) was predictive of health and well-being two years later[40]. This was irrespective of stage of disease, presence of stoma or treatment received. A follow-up paper showed self-efficacy did not change over this two year period supporting the notion of intervening early[41].

Research has found that people with highest distress levels, when compared with those with the lowest, experienced increased rates of death from specific cancers, especially colorectal and prostate, suggesting a need for better psychological management in cancer patients to help alleviate their distress[42]. Research into ongoing risk of suicide after cancer diagnosis and treatment suggest that people diagnosed with cancer have higher rates of suicide than the general public, especially following diagnoses of lung, stomach and head and neck cancer[43].

## Impact of poor nutrition on outcomes

Patients with cancer are at particularly high risk of malnutrition because both the disease and its treatments threaten their nutritional status. There is strong evidence that people who are underweight and weight losing have an increased risk of poorer outcomes – mortality, length of stay, higher costs of health care, risk of surgical site infections, and quality of life – from cancer treatment[44]. This data relates principally to surgery, but there is also some evidence for neo-adjuvant and adjuvant treatments.

Preoperative malnutrition has been reported to correlate with unfavourable long-term outcomes in patients who undergo surgery for gastroenterological cancers, including oesophageal, gastric, colorectal, and pancreatic cancers, as well as for head and neck cancer, lung cancer and hepatocellular carcinoma[44,45,46,47,48,49].

**3** Appropriately targeted interventions aimed at improving physical and/or mental health (exercise, nutrition, psychological interventions) along with behavioural change are safe[50], accepted and welcomed by people with cancer and promote quality of life. A growing body of evidence suggests that they may also reduce side effects of treatment. Prehabilitation may, in some cases, allow people with cancer to access treatments that were not previously available to them.

## Physical activity and exercise interventions

Evidence on this subject is emerging and suggests that exercise is safe and feasible in the weeks prior to surgery and during neo-adjuvant treatment[51]. Cardiorespiratory fitness and lung function were improved in a meta-analysis of five randomised control trials (RCTs) s of lower and upper body aerobic training pre-surgery[52]. Small cardiorespiratory fitness improvements were also reported from a systematic review of seven RCTs of walking or cycling programmes in patient undergoing abdominal surgery[53]. There is also preliminary evidence of fewer post-operative complications, shorter hospital stays, more treatment success and potential impacts on prognosis. Fewer post-operative complications and shorter stays hospital stays were reported in the Cavalheri Cochrane review[51] and reduced rates of urinary incontinence 3 months post prostatectomy were reported from a presurgical pelvic floor exercises in a meta-analysis of 6 randomised control trials[54].

## Nutrition

For people who are underweight and weight losing and at risk, there is strong evidence that nutritional interventions involving oral nutrition support (including oral nutrition supplements (ONS)) or Artificial Nutrition Support (ANS) are effective at improving nutritional status and improving clinical outcomes, particularly around surgery[44]. There is less information on the effectiveness of dietetic counselling on improving outcomes.

The strongest evidence for nutritional intervention is for people who are undergoing surgery. We do not know if people who are undergoing other treatments including Systemic Anti-Cancer Therapy (SACT) and radiotherapy will benefit from addressing their nutritional needs to an extent where it will influence clinical outcomes such as tolerance and response to treatment.

It is less clear for people who are overweight but undernourished and how that impacts on outcomes in response to surgery and the need to address nutrition prior to commencing cancer treatment. This is largely because there is an absence of literature to inform and guide us as to what the best approach would be. The absence of evidence does not allow us to make a recommendation at this point in time. We do know that people who are overweight or obese who then lose weight have poorer outcomes, but at this point it is not clear how to identify the people who would most benefit from an intervention and what that intervention should be[44,55].

With regards to the safety of nutritional interventions, the provision of ANS does have known risk factors associated with the placement and maintenance of access devices including enteral feeding tubes and central venous access. The delivery of artificial nutrition also has inherent risks associated including infection and metabolic risks. These risks can be minimised when care is delviered by appropriately trained and competent professionals adhering to guidelines.

## Psychological support

A systematic review of psychological interventions prior to surgery for cancer (seven studies) showed that there was no effect on surgical outcomes (eg length of hospital stay, complications, analgesia use, or mortality) but that the intervention positively affected patients' reported outcome measures (PROMS) including psychological outcomes, quality of life, and somatic symptoms[56]. A further systematic review concluded that it was important to stratify care and target interventions at patients who reached 'caseness' (meeting the diagnostic criteria for a psychiatric disorder)[57].

**4** Prehabilitation sits within a broader context of health improvement for people with cancer including smoking and alcohol cessation, medication review, and management of long-term conditions, that will not be considered within the scope of this guidance.

Relevant resources to support healthy lifestyles and improve long-term health are described in section 7c) under universal interventions. People with cancer and those who care for them should be signposted to these resources and encouraged to engage with them. The opportunity presented by the "teachable moment" that occurs in anticipation of cancer treatment should be exploited to maximum effect to benefit long-term health behaviours and outcomes.

Hayley – pancreatic neuroendocrine tumour

# 6. Prehabilitation in the cancer care pathway

**5** Prehabilitation, as a component of rehabilitation, should underpin the whole cancer pathway and is an approach we seek for all patients through co-developing a personalised prehabilitation care plan (PPCP) as a part of a patients overall care plan. Prehabilitation can optimise cancer treatment by promoting health and well-being as part of a continuum of preventative, restorative, supportive and palliative rehabilitation interventions. Prehabilitation, specifically including exercise, nutrition and psychological support, should be integral to the care of all people with a cancer diagnosis.

Dietz[58] described four rehabilitation stages for cancer: preventive (prehabilitation), restorative, supportive, and palliative. During each phase of rehabilitation, the physical, mental, emotional, social, sexual, and economic needs of the patient must be considered. These four phases are described in table 3 below.

**6** All cancer treatments are led through cancer multidisciplinary teams (MDT). The cancer MDT should have representation from those delivering prehabilitation therefore providing oversight of the prehabilitation needs of the person to ensure prehabilitation is taking place. Community hub MDTs also have an important role in supporting some people with cancer with physical activity and exercise, nutrition and psychological support. This will be in collaboration with specialist, hospital based oncology teams.

**7** Personalised prehabilitation care plans (PPCP) as part of a person's care plan should be a document that encompasses **nutrition, physical and psychological screening for all** people with cancer to identify need for more detailed assessment, **individualised assessment according to need, and an individualised intervention prescription based on the screening and assessment process** along with on-going support and evaluation to aid uptake and adherence.

**Table 3: Dietz stages of rehabilitation**

| **1 Preventive rehabilitation** |
|---|
| Starts soon after cancer has been diagnosed. Performed before or immediately after surgery, radiotherapy or chemotherapy. No impairments of function present yet. Preventing impairments is the purpose of the rehabilitation measures. |
| **2 Restorative rehabilitation** |
| Aims for the maximal recovery of function in patients with remaining function and ability Attempts to achieve maximal functional recovery in patients who have impairments of function and decreased abilities. |
| **3 Supportive rehabilitation** |
| Increases self-care ability and mobility using methods that are effective (eg guidance with regard to self-help devices, self-care and more skilful ways of doing things) for patients whose cancer has been growing and whose impairments of function and declining abilities have been progressing. Also includes preventing disuse, such as contractures, muscle atrophy, loss of muscle strength and decubitus. |
| **4 Palliative rehabilitation** |
| Enables patients in the terminal stage to lead a high QOL physically, psychologically and socially, while respecting their wishes. Designed to relieve symptoms, such as pain, dyspnoea and oedema and to prevent contractures and decubitus using heat, low-frequency therapy, positioning, breathing assistance, relaxation or the use of assistive devices. |

A personalised prehabilitation care plan (PPCP) can help people with cancer:

- Understand their condition(s)
- Feel more confident and able to manage their own health and care
- Take an equal role with professional partners in decision making
- Understand the options available to them
- Be as independent as possible and illustrate progress
- Play a more active role in managing their health and wellbeing and get recognition and support from professionals in this role
- Rapidly identify a deterioration in their condition or symptoms
- Build on their strengths and feel supported in doing or achieving what matters to them, which may include the role of their carer
- Recognise trigger points and early warning signs
- Understand when to seek help and where from
- Maintain social connections, have opportunities to learn new skills and being able to contribute back to the community

The intended outcomes from the development of a PPCP is likely to result in at least one of the following:

- Change in health and wellbeing, including physical and psychological
- Change in capabilities for managing their condition
- Change in health-related behaviours (secondary)
- Change in use of health services (secondary)

Some examples of personal outcomes that could be included in a PPCP would include:

- To feel fitter, stronger and healthier
- To better manage my pain relief so I don't wake up at night
- To stay in my house as long as possible
- To stop taking anti-depressants because I don't like the side-effects
- To meet new people in my local area so I don't have to travel into the centre of town

The goals and actions identified in the PPCP would benefit from focussing on self-management strategies and any additional support they might need. For example, some common self-management strategies include:

- Recognising and responding to symptoms
- Using medicine
- Responding to acute episodes and emergencies
- Managing nutrition, diet and exercise
- Giving up smoking
- Using relaxation and stress reduction techniques
- Interacting with health care providers
- Seeking information and using community facilities and resources
- Adapting to work
- Managing relationships with significant others
- Managing emotions

**8** Interventions targeted at improving physical and/or mental health should start as early as possible and in advance of any cancer treatment (not just the first cancer treatment).

There is a growing body of scientific evidence that supports preparing newly diagnosed cancer patients as early as possible before starting acute treatments. Recent research shows that opportunities exist to use unimodal or multimodal prehabilitation interventions to decrease morbidity, improve physical and psychological health outcomes, increase the number of potential treatment options, decrease hospital readmissions, and reduce both direct and indirect healthcare costs attributed to cancer[59]. Although benefit from prehabilitation interventions has been shown in as little as two weeks, the available health benefits will be maximised if people with cancer have as long as possible for prehabilitation interventions to have impact. It is important to note the variability in the strength of evidence particularly for multi-modal interventions.

Kenneth at the gym

# 7. Guidance on the different stages of the cancer pathway

## a) Screening

**9** Identification of people with cancer requiring prehabilitation (ie screening) should occur **as early as possible from diagnosis** (and in some cases before a confirmed diagnosis), and in advance of each treatment. Screening should use validated tools to identify the need for more detailed assessment in order to inform the prescription of targeted or specialist interventions. Screening should be aligned to the Holistic Needs Assessment (HNA) and should include psychological risk factors, physical fitness and nutrition including evaluation of weight loss, poor intake and body mass index and nutrition impact symptoms.

Holistic Needs Assessment (HNA) is a useful tool to identify the needs for prehabilitation interventions in people with cancer[60]. HNA can identify physical, emotional, psychological and practical needs. The HNA is well placed for screening and pre-assessment for prehabilitation and can signpost to information, encouraging patients and health and care professionals to anticipate problems and intervene early to mitigate them. The electronic HNA, or E-HNA, supports the completion of the tool on a touch-screen tablet.

The following are candidate screening tools, identified by the expert groups, that may be used along with the HNA. These tools are aimed at screening people more specifically about physical activity and physical fitness, nutrition and psychological support to help identify needs for prehabilitation.

**Physical activity and exercise**
Physical activity is "any bodily movement produced by skeletal muscles that results in energy expenditure"[61].

Exercise is "a subset of physical activity that is planned, structured, and repetitive and has, as a final or an intermediate objective, the improvement or maintenance of physical fitness.

**Contraindications to exercise in people with cancer**
There should be caution where cancer has spread to bone and during treatment associated with reduced immunity or reduction in normal blood counts. In these situations, the advice of the oncology team should be sought[62,63,4].

**Physical activity screening tools:**

- Self-report physical activity; IPAQ[64]. The International Physical Activity Questionnaire (IPAQ) was developed to measure health-related physical activity (PA) in populations.
- The Scottish Physical Activity Screening Questionnaire (Scot-PASQ) provides a framework for meaningful physical activity conversations between health or social care professionals and people in their care. Scot-PASQ enables description of activity levels and informs what physical activity support is needed[65].
- The Godin-Shephard Leisure-Time Physical Activity Questionnaire (GSLTPAQ);is a short questionnaire that is often used to assess leisure time physical activity and exercise in oncology research[66].
- General Practice Physical Activity Questionnaire (GPPAQ). The general practice physical activity questionnaire (GPPAQ ) is a validated screening tool, used in primary care to assess the physical activity levels of adults (16 to 74 years). It provides a simple, 4 level physical activity index (PAI). Practitioners can use this index to help them decide when to offer interventions to increase physical activity[67].
- The physical activity stage of change assessment tool[68] is a simple screening test used to gauge how motivated a patient is to engage and adhere to a physical activity intervention. It provides those doing the screening with specific strategies and goals relative to the patient's particular stage of change.

- Other screening tests such as sit to stand test and sit and reach tests for basic functioning[69] can also be used.
- Wearable technology monitors are increasingly being used to obtain objective measures of physical activity in oncology trials. These monitors can help identify whether or not a person meets a specific threshold for physical activity. There is potential for their use for screening and assessment of activity and exercise as well as to evaluate and predict clinical outcomes such as survival, quality of life, and treatment tolerance in future studies[70].

**Physical fitness screening tools**

- Self-report measures of physical fitness and function (eg Duke Activity Status Index (DASI) and Clinical Frailty Score[71]
- Other relatively brief tests can be used such as sit to stand test and sit and reach tests for basic functioning[69]. Eg,
  - 6-minute walk test – assesses distance walked over 6 minutes as a sub-maximal test of aerobic capacity/ endurance[72]
  - Incremental shuttle walk test – developed to simulate a cardiopulmonary exercise test using a field walking test[73].
  - Timed-up-and-go test – simple test used to assess a person's mobility and requires both static and dynamic balance. It uses the time that a person takes to rise from a chair, walk three meters, turn around, walk back to the chair, and sit down[74]
  - 30 second chair-stand test – an assessment of postural hypotension can help to indicate if a patient is at risk of falling.[75]

**Nutrition screening tools**

The Malnutrition Universal Screening Tool (MUST) is a five-step screening tool to identify adults who are malnourished or at risk of malnutrition (undernutrition) or obese that uses current weight (as body mass index, unplanned weight loss and an acute disease effect subjective element together to obtain an overall risk of malnutrition. It also includes management guidelines which can be used to develop a care plan. It is for use in hospitals, community and other care settings and can be used by all care workers[76].

There is accumulating experience that using MUST in oncological settings does not adequately characterise risk and that the 'acute disease effect' element should more specifically consider nutrition impact symptoms eg taste and smell alterations, swallowing problems, abdominal pain, mucositis, nausea, constipation, pain and its treatment, shortness of breath, and fatigue. This is supported by studies that have shown good sensitivity in identifying patients at risk of malnutrition for some tools such as the Royal Marsden nutrition screening tool[77] and the Malnutrition Screening Tool[78]. The Royal Marsden nutrition screening tool (validated in inpatients), has excellent sensitivity for identifying patients who are malnourished or at risk of malnutrition in the inpatient setting, although it has relatively poor specificity. The Malnutrition Screening Tool[78] (validated in outpatients) has good sensitivity in outpatient oncology settings, both for radiotherapy and chemotherapy patients, and in a general residential setting in older adults.

There is also interest in the scored Patient Generated Subjective Global Assessment questionnaire (PG-SGA) as a screening tool to identify those most at risk (the full PG-SGA is actually an assessment tool)[79]. The PG-SGA has high sensitivity and specificity in detecting those at risk of malnutrition. It has been widely used in other oncology and patient settings and has performed well against other tools such as the Malnutrition Screening Tool and the Mini nutritional assessment[80] and is therefore used to cross validate other screening tools.

Irrespective of which tool is used, it is important that the same tool is used in all settings for any particular patient, and that it is used from the earliest opportunity to risk stratify and direct care.

**Psychology and wellbeing screening tools**
Specific psychology screening tools would include:

- Patient Health Questionnaire (PHQ-9)[81]. Although this is not technically a screening tool, it is used frequently by clinical psychologists to help identify those most in need of support
- Generalised Anxiety Disorder Assessment (GAD-7). This is used as a screening tool in clinical practice, often alongside PHQ-9[82].
- Hospital Anxiety and Depression Scale (HADS)[83]. This is commonly used in research and has cut-offs for clinical depression/anxiety.

Wellbeing screening tools would include:

- EQ5D-3L[84]. The EQ-5D-3L descriptive system comprises the following five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has 3 levels: no problems, some problems, and extreme problems. The patient is asked to indicate his/her health state by ticking the box next to the most appropriate statement in each of the five dimensions. This generic tool is one of two validated screening tools being used in the quality of life metric pilots for cancer being undertaken by NHS England. The other tool is a cancer specific tool, the EORTC – QLQ-C30[85].
- Fatigue – An important consideration in fatigue management is the extent to which fatigue interferes with a person's day to day life. For example, someone could report relatively low levels of fatigue but with a significant impact on their lives, whereas others may report higher levels but are better able to manage it. The Brief Fatigue Inventory captures this and is nice and short[86]. EORTC QLQ-FA12[87] assesses physical, cognitive and emotional aspects of cancer-related fatigue.
- GSE – General Self Efficacy Scale (Self-efficacy is an individual's belief in their innate ability to achieve goals). The General Self-Efficacy Scale is a 10-item psychometric scale that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life
- Patient activation measure (PAM)[88]. Endorsed by NHS England and the Kings Fund. There is evidence that higher PAM scores equate to lower health care costs.

## b) Assessment

10 Individualised assessment, when indicated, should encompass comprehensive evaluation of needs identified during screening using validated clinical measurement techniques. Assessments should inform the individualised prescription of exercise, nutrition and psychological interventions.

Whilst screening is a relatively easy task that can be conducted by most health and care professionals in all settings and offers simple risk stratification, screening does not diagnose the nature of the specific deficit that determines the risk, nor does it adequately direct care.

Assessment requires a more complete approach that includes taking a history, examining the patient, conducting special tests and then judgement to infer the likely pathology that underlies the presentation (eg making a diagnosis to inform clinical decision making). Assessment may also be used to determine the effectiveness of any intervention over time.

Assessment and prescription (of targeted and specialist interventions) should be undertaken by a professional registered with a UK health and care regulator eg dietitians working within their scope of practice.

The following are possible approaches to

assessment identified by the expert groups, that are likely to have utility in the identification of need for prehabilitation.

**Physical fitness assessment**
Those identified as at risk following screening should undergo more formal physical fitness assessment.

Relatively brief objective measures of functional capacity (eg 6 minutes walk test[89], timed-up-and-go test[90], 30s chair-stand test[91]) may be appropriate to detect those who should receive exercise prehabilitation.

For those who are fitter there will be a ceiling affect therefore the Cooper test or the Step test could be used. The Cooper test is a test of physical fitness also referred to as the 12 minute run test[92]. The Step test is an evaluation of recovery to a functional activity (step climbing) over 3 minutes[93].

In some settings, standard of care preoperative assessments may include more comprehensive evaluation of cardiorespiratory fitness, such as pulmonary function tests or cardiopulmonary exercise testing (CPET). CPET is the 'gold standard' that, if implemented near the time of diagnosis, may serve as an appropriate assessment and on-going measure of prehabilitation needs.

There is a need to know the baseline functions of tissues known to be affected by treatment so that deficits can be appropriately quantified and prehabilitation and rehabilitation targets can be appropriately set.

**Nutrition assessment**
Those identified as at risk following screening should undergo more formal nutritional assessment. Nutrition screening is intended to identify those most likely to be at risk of disease-related malnutrition, whilst nutritional assessment is the systematic process of collecting and interpreting information in order to make decisions about the nature and cause of nutrition related health issues that affect an individual. In making a nutritional diagnosis, it is possible to determine better the nature of the nutritional deficit, inform clinical decision-making, and direct care. Assessment is best carried out by a dietitian who has the necessary prerequisite knowledge, professional skills and understanding to able to take and interpret a dietary history, assess eating habits and dietary impact factors, make measurements of anthropometry and body composition and muscle mass, and request and interpret biochemical tests of micronutrient status. This information will inform decisions relating to the most appropriate and practical personalised nutrition care plan and implementation[94].

**Psychological needs assessment**
Those identified as at risk following screening should undergo more formal assessment for psychological support needs.

The tools suggested for psychological screening in the previous section can also be used for assessment. These would include:

- Patient Health Questionnaire (PHQ-9).
- Generalised Anxiety Disorder Assessment (GAD-7).
- Hospital Anxiety and Depression Scale (HADS).

## c) Intervention

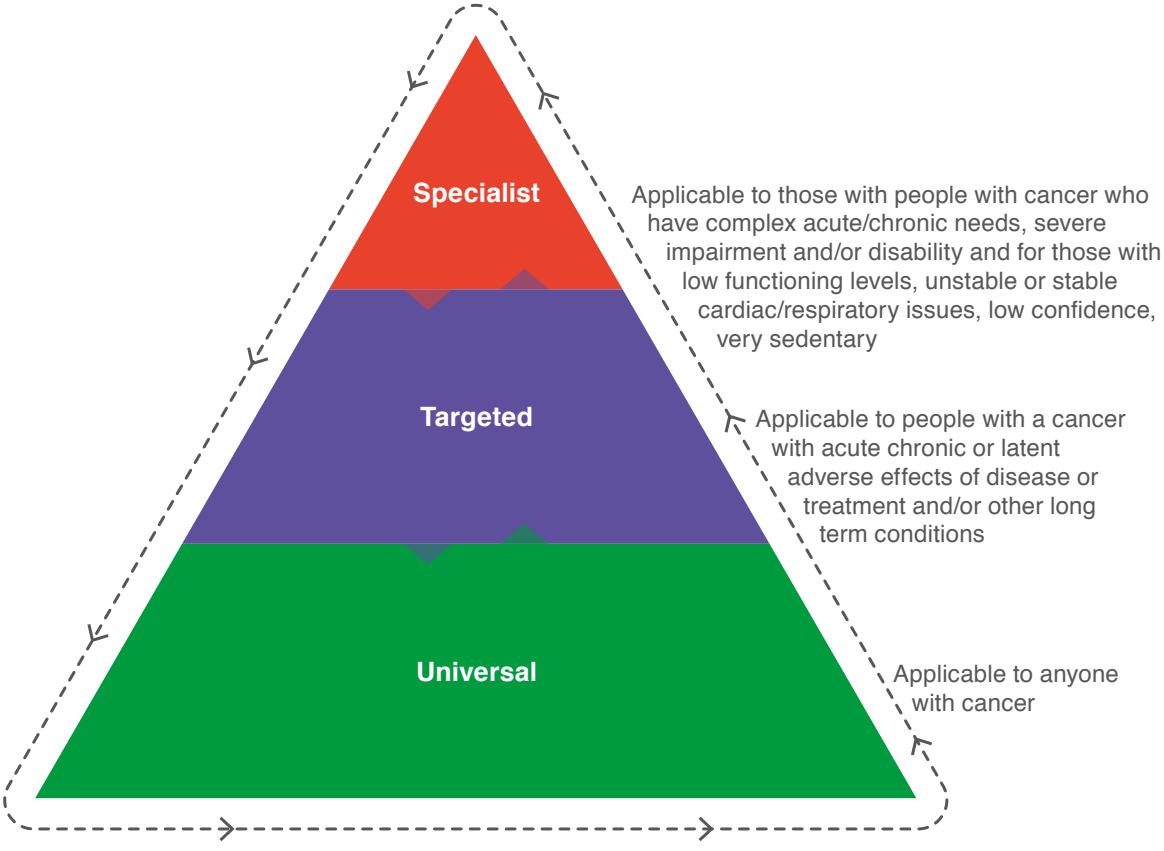
**11** Prehabilitation interventions can be categorised into universal, targeted and specialist (Figure 3).

It is important to recognise that physical activity and physical fitness, nutrition, psychology should be assessed, and patients may have different degrees of risk for any given element. Some patients will have targeted intervention for one element, specialist for another and universal for another or specialist for two interventions and targeted for one intervention.

Prehabilitation interventions may begin at any point from diagnosis (and in some cases before a confirmed diagnosis) and are undertaken with the ambition of improving the physical and/or psychological health of a person with cancer. Prehabilitation typically lasts 4–6 weeks depending on the length of time between diagnosis and starting treatment whether surgery and/or radiotherapy and/or chemotherapy and can continue throughout treatment. Prehabilitation interventions can still be effective if begun as little as two weeks prior to treatment[1].

People with cancer may need different levels of interventions (ie universal, targeted, specialist) in different domains of prehabilitation (ie exercise, nutrition, psychological support/behaviour change) depending on their individual needs in each area. They may also move up and down the levels described by the triangle of interventions.

**Figure 3: Prehabilitation interventions**



**Universal interventions**: Universal interventions are applicable to anyone with cancer. People with a cancer diagnosis, and their families, should receive dietary, exercise and psychological advice and behaviour change support, be sign-posted to appropriate resources, and be advised on how to self-manage, recognise and respond to any change in physical and/or psychological state. People with cancer receiving targeted and specialist interventions in particular areas will also require advice, support and signposting in areas where they are not receiving targeted/ specialist interventions.

Universal interventions include the promotion of healthy lifestyle in people living with cancer. This will include those areas that can make the greatest improvement to an individual's health and wellbeing including:

- Healthy eating
- Being physically active and physically fit
- Keeping to a healthy weight
- Improving mental health and wellbeing.
- Stopping smoking
- Drinking alcohol only within the recommended limits

Support for people living with cancer can include:

- Health and wellbeing support, information and supportive conversations as are part of personalised care[9]. This can include information and support about diet and lifestyle, the possible long-term side-effects of treatment, issues surrounding type of cancer, benefits and other financial support, how to get back to work and local services, facilities and other opportunities available.
- Macmillan Cancer Support has a wealth of resources to support people with cancer with healthy lifestyle advice[95] as well as the management of the symptoms and side effects of cancer and its treatments[96].
- One You[97] is an NHS resource which can help people get healthier and feel better with free tips, tools and support.
- Moving Medicine[98] includes resources for health and care professionals and patients with the aim of encouraging behaviour change.

Universal interventions can be delivered by any health and care professional or may be self-delivered by people with cancer. A number of tools and resources can be used to support health and care professionals to give general healthy lifestyle advice.

These include:

- Making Every Contact Count (MECC)[99,100] is an approach to behaviour change that utilises the millions of day-to-day interactions that organisations and individuals have with other people to support them in making positive changes to their physical and mental health and wellbeing. MECC enables the opportunistic delivery of consistent and concise healthy lifestyle information and enables individuals to engage in conversations about their health at scale across organisations and populations. MECC focuses on the lifestyle issues that, when addressed, can make the greatest improvement to an individual's health. For staff, MECC means staff having the competence and confidence to deliver healthy lifestyle messages, to help encourage people to change their behaviour and to direct them to local services that can support them. There are evidence-based training resources on how to MECC[101] available through NHS Health Education England website[102].The

E-learning for health four short modules on MECC are a useful resource for staff to undertake. Each module takes approximately 20 – 30 minutes and include the following topics: Introduction to MECC, introduction to skills and how to start a health conversation, introduction to lifestyle topics and signposting and your organisation.

- All Our Health[103] is a framework of evidence to guide health and care professionals in preventing illness, protecting health and promoting wellbeing. All Our Health is a call to action for all health and care professionals to use their skills and relationships to maximise their impact on avoidable illness, health protection and promotion of wellbeing and resilience.
- A framework to promote person centred approaches in healthcare[104] is a collaboration across a wide range of stakeholders including Health Education England, Skills for Health, Skills for Care, citizen, patient and carer voice, voluntary sector organisations, Public Health England, Local Government, NHS England, Royal Colleges, the professional bodies, professional regulators and others

**Physical activity and exercise**
Universal interventions may include physical activity and/or exercise. Exercise will now be the term used to describe specific targeted and specialist interventions.

**Nutrition**
Efforts should be made to do all that is possible to ensure that patients meet their needs and receive nutritional care before, during and after treatment commensurate with their nutritional risk. All patients, irrespective of risk, should be able to access nutritional care. Those at the lowest risk should be able to access supportive, self-care advice and information (Universal). Those with identified needs should be directed to dietetic counselling with ONS as required (Targeted). Those at the highest risk with more complex needs would be directed to specialist services which may embrace dietetic support, ONS and where necessary ANS.[44]

Personalised care encompasses all aspects of nutritional care that should be incorporated into any advice; for example, pre-existing conditions (eg diabetes, coeliac disease) in addition to any impairments resulting from cancer treatment (eg surgery to the gastrointestinal tract). It should also include specific questions the person may have relating to diet and dietary supplements.

| Intervention | Description of universal interventions | Proposed workforce to support interventions |
|---|---|---|
| **Exercise**  | Recognising an individuals capability all people diagnosed with cancer should be introduced to the physical activity guidelines in cancer[105] – 150 minutes of moderate to vigorous aerobic physical activity per week plus at least two sessions of resistance training sessions per week.<br><br>This may be facilitated with signposting, campaigns, and communication with health care professionals.<br><br>Healthy conversations, MECC, supported self- management.<br><br>Use of self-management and healthy lifestyle websites and/or APPs. | All health and care professionals.<br><br>Fitness professionals with cancer specialist training. |
| **Nutrition**  | Healthy eating guidance within supportive, self-care.<br><br>Dependent on the choices and actions of the individual (behavioural intervention). It assumes that the patient has access to food, can eat and swallow and a functioning gastrointestinal tract).<br><br>Healthy conversations, MECC, supported self- management.<br><br>Use of self-management and healthy lifestyle websites and/or APPs. | All health and care professionals including those that are not specialists in nutrition such as nurses, oncologists, surgeons or anaesthetists and unregistered staff such as support workers. |
| **Psychological support and behaviour change**  | Effective information giving, compassionate communication and general psychological support.<br><br>Healthy conversations, MECC, supported self-management.<br><br>Use of self-management and healthy lifestyle websites and/or APPs. | All health and care professionals.<br><br>Fitness professionals with specific training. |

**Targeted interventions**: These interventions are applicable to those people with cancer with and at risk of late effects of disease or treatment and those with other long-term conditions. People with a cancer diagnosis with specific needs identified during screening should be prescribed exercise, nutrition and psychological interventions and behavior change support by a registered health and care professional according to need and adherence and effectiveness should be monitored.

| Intervention | Description of targted interventions | Proposed workforce to support interventions |
|---|---|---|
| **Exercise**  | Referral/support for appropriate re-conditioning and/or prehabilitation exercise programmes including Healthy Conversations, should be incorporated into care.<br><br>This group does not have an absolute contraindication to exercise; but rather, needs support based on disease/ treatment/side effects/co-morbidities.<br><br>Group exercise or one-to-one support in local community gym setting run by cancer exercise specialists such as Move More[106] – aiming to increase frequency, intensity and duration of exercise incrementally to get as near as possible to 150 minutes of moderate intensity (75 min vigorous intensity or combination) by surgery or treatment date.<br><br>Some supervision and structured exercise may be required for those who are sufficiently active (30–150 minutes per week) or those with low self- efficacy.<br><br>Where possible interval training including moderate severe exercise intensities should be included as this has been shown to improve physical fitness. | Targeted type of exercise programming with involvement from a more specialised group of cancer exercise specialists that include:<br>• Physiotherapists<br>• Specialised exercise physiologists<br>• Rehabilitation/therapy support workers<br>• Trained cancer exercise fitness instructors |

| Intervention | Description of targted interventions | Proposed workforce to support interventions |
|---|---|---|
| **Nutrition**  | Nutrition assessment and nutritional care should be offered by a dietetic/nutritional professional where advice and guidance is person-centred and based on the nutritional assessment. The advice will inform individual needs and is focused on the types and amounts of foods/drinks consumed and assumes a functioning gastrointestinal tract.<br><br>Dietetic counselling may aim to improve food intake (quantitatively/qualitatively), address the presence or severity of symptoms that may limit eating and drinking, or to determine adherence with therapeutic advice. Dietetic counselling also considers other medical conditions affecting dietary intake (eg diabetes and other long term conditions that have dietary implications). Critical components of nutrition counselling are to assess the patients readiness to change, convey to the patient the reasons and goals for nutritional recommendations and motivate the patient to adapt to altered nutritional demand of their disease. If dietary modification is not sufficient, then products that are defined and regulated as foods for medicinal purposes (eg micronutrient supplements, protein supplements, oral nutrition supplements) either to fortify the diet or supplement the oral intake may be prescribed and/or patient may be fed a controlled diet under supervised conditions eg high energy, high protein fortified meal choices advised as part of an inpatient hospital stay. | Dietitians. |
| **Psychological support and behaviour change**  | Psychological techniques such as problem solving.<br><br>Counselling and specific psychological interventions such as anxiety management and solution-focused therapy, delivered according to an explicit theoretical framework. | Health and care professionals with additional expertise in psychological support/behaviour change such as:<br>• Clinical nurse specialists<br>• Chemotherapy nurses<br>• Dietitians<br>• Health psychologists<br>• Occupational therapists.<br>• Physiotherapists<br>• Speech and language therapists |

**Specialist interventions**: Specialist interventions are applicable to people with cancer who have complex needs, complex treatment eg major surgery, severe impairment and/or disability. These people will need referral to registered professionals to prescribe appropriate exercise, nutrition and psychological interventions and behavior change support according to need. Adherence and effectiveness should be monitored.

| Intervention | Description of specialist interventions | Proposed workforce to support interventions |
|---|---|---|
| **Exercise**  | Fully supervised exercise intervention (aerobic/endurance/strength) for those very inactive/sedentary/co-morbidities, contemplative/low self-efficacy or treatment related indication (eg major surgery). | Once acute issues are resolved, they may re-engage with the 'Targeted' type of exercise programming (including HC), delivered by qualified cancer exercise professionals, which may need to take place in-hospital with medical oversight eg physiotherapists |
| **Nutrition**  | Artificial Nutritional Support (ANS) should be offered by a nutrition/dietetic professional where ANS artificial nutrition support is delivered to the patient via enteral or parenteral nutrition as a result eg of location of tumour, swallowing problems (dysphagia), excessive weight loss, management of high output stomas, other long term conditions such as diabetes, intestinal failure. This might be used to supplement the oral intake or used exclusively to meet their needs and includes enteral nutrition delivered by tube (eg Nasogastric tube, Jejunostomy tube, Percutaneous Endoscopic Gastrostomy) or delivered intravenously as parenteral nutrition (PN). The patient is prescribed nutrition and delivery is less dependent on the individual being taught how to administer it or by it being provided by carers. | Dietitians, Nutrition Support Teams, Intestinal Failure Units |
| **Psychological support and behaviour change**  | Specialist psychological and psychiatric interventions such as psychotherapy, including cognitive behavioural therapy (CBT). | Mental health specialist staff such as:<br>• Clinical nurse specialists Health Psychologists<br>• Occupational therapists<br>• Psychiatrists<br>• Psychotherapists<br>• Psycho-oncologists |

# Prehabilitation in action with people – some illustrative examples

### i) An example of universal interventions

**Mrs Smith**

Mrs Smith is a 63 year old woman who lives with her husband. She has been diagnosed with bowel cancer and is due to have surgery to remove her tumour in four weeks. She works part time as a bookkeeper, looks after her grandson one day a week and is part of a walking group. Upon entering her prehabilitation programme, she completes activity/exercise screening (incl. the 6 minute walk test), nutritional screening (including Body Mass Index, weight trend and IDDSI (International Dysphagia Diet Standardisation Initiative)[107] score and wellbeing measures (Patient Report Outcome Measures) including the EQ-5D, cancer specific outcome measures and measures of disability, frailty, self-efficacy and physical activity). As a result of the result of these screening tests she is stratified into the 'Universal' group for nutrition, psychology and exercise and engages in the following interventions:

**Exercise**: Free gym membership at the local council gym, DVD MoveMore programme[106] advice and signposting about local physical activity and exercise opportunities to undertake throughout the week.

**Nutrition**: Low risk therefore given a prehabilitation dietary advice fact sheet with verbal supporting information from instructors. Further weekly nutritional screening completed. Encouraged to report any changes in appetite and symptoms that may impact of their eating.

**Psychological support**: Instructors noticed Mrs Smith experiencing distress. Using level 1 (Stepped Care Model) psychological skills particularly listening and empathy skills they reassured Mrs Smith, facilitating her to consider her existing support networks (family + friends) to address her feelings of concern and anxiety. They made her aware of local IAPT services she can self-refer into. They provided further information about Holistic Needs Assessment and liaised with Mrs Smith's Macmillan team, particularly her CNS, who had referred her into prehab. A few weeks into the programme Mrs Smith reported feeling less anxious after her exercise sessions.

### 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 reporting the prehabilitation classes are making him feel 'more motivated to look after myself' due to the shared experience of exercising in a group and the support he is receiving from his 'classmates'. He particularly enjoys making others in his group laugh. His instructors have made him aware of extra psychological support available within his community and from the health and care professionals at the hospital (including the nurses, allied health professionals and if necessary the psychologists).

### iii) An example of specialist interventions

#### Mr Khan

Mr Khan is an 82 year-old male who attends pre-operative assessment clinic, four weeks before a right hemicolectomy for carcinoma of the ascending colon. He smokes 20 cigarettes per day and drinks approximately 20 units of alcohol per week. He spends most of his day sitting down watching television and eating take-away food ordered from the local shops. He has a history of hypertension, type 2 diabetes, moderate chronic obstructive lung disease and anxiety for which he is on thiazide, metformin, salbutamol and citalopram. His cardiopulmonary exercise test (CPET) revealed oxygen uptake at anaerobic threshold of 6.9mL/min/kg with peak oxygen uptake of 11.8mL/min/kg.

Although this is a relatively straightforward operation, Mr Khan condition and co-morbidity places him at a high relative-risk for surgery. Mr Khan is keen to proceed with curative surgery but is highly anxious on hearing about his high-risk status. He is stratified into the specialist intervention group for exercise, nutrition and psychology but also engages with the available universal interventions.

**Exercise**: On a prehabilitation pathway, he was recommended for a supervised, in-hospital exercise training programme to improve physiological fitness with an exercise prescription designed by a physio/ clinical exercise physiologist or supervised by a cancer exercise specialist.

**Nutrition**: He had a review with a dietitian to offer dietary counselling and assess his need for nutritional intervention/support.

**Psychological support**: He was recommended one-to-one sessions with a psychologist to prepare mentally for the stress of surgery

In addition, he will attend surgery school and a specialist smoking cessation clinic.

**Contraindications to exercise**
There should be caution where cancer has spread to bone and during treatment associated with reduced immunity or reduction in normal blood counts. In these situations the advice of the oncology team should be sought.[2,3,4]

## d) Monitoring and evaluation

**12** Monitoring of interventions should be proportionate to need. Universal interventions should be self-monitored and recorded via the HNA or equivalent process. Targeted and specialist interventions should be monitored for adherence and effectiveness using appropriate validated measures.

It is only by monitoring (i) adherence to process, (ii) efficacy and experience (iii) outcomes in a standardised manner that it will be possible to evaluate the effectiveness of any intervention. It is important to be able to differentiate between those who are unable to engage in the intervention as it is deemed inappropriate, from those who decline the intervention, and those who only partly adhere from those who fully adhere in order to be able to best evaluate the impact of the intervention. There is a need to understand better why patients decline or only partly adhere with the prescribed intervention, and to determine the factors that influence the response to the intervention.

Physical fitness should be monitored using validated tools commensurate to the type of intervention being undertaken, eg **Universal**, self-reported physical activity and/or wearable technology monitors; eg **Targeted**, Self-report measures of physical fitness and function (eg, Duke Activity Status Index; DASI; Clinical Frailty Score[71]; eg **Specialised**, comprehensive evaluation of cardiorespiratory fitness, such as cardiopulmonary exercise testing.

In terms of nutrition given the lack of validated simple tools, the onus is on the health and care professional to determine the extent to which the individual is successfully adhering to the process of the intervention and achieving the required behavioural goals or expectations. This is dependent on the professional skills and attributes of the practitioner as well as the capabilities, motivation, and circumstances of the patient.

Monitoring dietary change is challenging, and the consumption of ONS outside of the clinical environment cannot be assumed and may also impact on oral food intake (substituting supplement for food without a net increase in intake). One study that specifically sought to measuring adherence to nutrition and lifestyle interventions (excess weight gain in pregnancy) is by Nagpal[108]. They constructed a goal scoring system with defined criteria using predefined goals given as advice – effectively measuring reported behaviours around diet and activity goals.

The tools outlined above for psychological assessment should be appropriate for monitoring psychological outcomes.

# 8. Planning and delivery of prehabilitation services

**13** Prehabilitation is a means of transforming patient care to achieve sustainable high-quality services within the current mandated performance framework. The principal focus should be on optimising the efficiency and timeliness of current pathways from the moment of consideration of treatment onwards, without unnecessarily delaying scheduled treatment (Patients best interests should be considered on a case by case basis and this may, in some circumstances, result in delaying treatment).

Delivering prehabilitation as part of cancer pathways aligns with several of the key priorities in the NHS Long Term Plan[10], the NHS England Commissioning Guidance for Rehabilitation[109] and other relevant policies in the devolved nations[110,111,112] including:

- providing the opportunity to deliver 'out of hospital care' and integrated care to those with cancer from diagnosis onwards and support them before and during their treatment
- supporting prevention by promoting health and wellbeing and reducing risk factors which can predispose people to cancer and other long term conditions
- giving people the ability to be fitter as they face treatment for cancer and throughout the pathway
- using technology and digitally enabled care to support people to self- manage their health and wellbeing.

The following section describes the areas for consideration in the planning and delivery of a prehabilitation as part of cancer pathways for use by those providing and commissioning cancer services.

**What do you need to consider when implementing prehabilitation at a local level?**

- What is currently being delivered for rehabilitation?
- What do your local cancer pathways look like? How do they vary be specially, tumour and treatment? How might these pathways need to change to support prehabilitation and optimise patients for treatment?
- What is the current capacity to deliver prehabilitation and rehabilitation in current services?
- How effective are the current services? – There are service improvement tools available to self evaluate prehabilitation services[113].
- Is there a service which looks to improve patients' health and wellbeing in advance of treatment whether surgery and/or chemotherapy and/or radiotherapy and/or immunotherapy?
- A multidisciplinary team is required: who do you have? what are their skills, knowledge and expertise? and how could they support prehabilitation?
- Does service transformation need to be considered and take place to enable incorporation of prehabilitation into the local cancer pathways?

**Who are the key stakeholders to engage with when considering prehabilitation in the management and support of people with cancer?**

- Allied Health Professionals such as dietitians, occupational therapists, physiotherapists and speech and language therapists.
- Anaesthetists
- Exercise physiologists
- Clinical nurse specialists
- GPs
- Lead cancer nurses
- Oncology team
- Physicians
- Primary care nurses
- Public health teams
- Psychologists
- Rehabilitation/therapy support workers
- Surgeons

**What staff do you need to deliver prehabilitation interventions?**
Existing evidence suggests that there is no defined group of health and care professionals required to deliver a prehabilitation service.

However, it is clear that prehabilitation should be provided by a multidisciplinary team.

Key staff groups to consider supporting prehabilitation would include any/all of the following:

- Allied Health Professionals such as dietitians, occupational therapists, physiotherapists and speech and language therapists.
- Anaesthetists
- Exercise physiologists
- Clinical nurse specialists
- GPs
- Oncology team
- Physicians
- Primary care nurses
- Public health teams
- Psychologists
- Rehabilitation/therapy support workers
- Surgeons

**Who should oversee prehabilitation as part of the management and support of people with cancer and the screening and assessment for prehabilitation?**
This will depend on local arrangements and staffing within the wider oncology MDT. Where a cancer MDT includes allied health professionals within their core membership prehabilitation could be a core part of their remit or of the clinical nurse specialist.

It is anticipated that screening for prehabilitation will be integrated into the wider assessment of patients using the HNA.

**Do one or all elements (exercise, nutrition and psychological support) of prehabilitation need to be delivered at once or can they be added sequentially?**
Ideally it would be preferable for people living with cancer to have access to interventions related to exercise, nutrition and psychological support depending on individual need. New studies suggest that a multimodal approach that incorporates both physical and psychological prehabilitation interventions may be more effective than a unimodal approach that addresses just one or the other[114].

People with different diagnoses will require different, tailored services.

However, it is recognised that all elements of a service may not be in place at the outset and may need to be phased into the delivery of prehabilitation based on local planning, service transformation and priorities.

**How beneficial is prehabilitation in the timeframes available in advance of treatment?**
Patients can benefit from prehabilitation interventions in just a two week period[1].

**Where can prehabilitation be delivered?**
Traditionally prehabilitation has been delivered in acute hospital settings however there is no reason why prehabilitation cannot be delivered in leisure centres community and primary care facilities which support easy access for patients.

**How should multiple prehabilitation interventions be managed, supported and co-ordinated?**
Prehabilitation should be delivered through a multidisciplinary approach with all members of the MDT understanding their role and their colleagues roles in supporting people living with cancer.

Prehabilitation represents a shift away from the impairment driven, reactive model of care towards a proactive approach that enables patients to become active participant in their care.

Prehabilitation programmes need to be personalised for people living with cancer.

The patient has an active role in prehabilitation and should be given the opportunity to be empowered to contribute to managing their own health and wellbeing. The success of the prehabilitation interventions therefore also depend on the motivation and capabilities of the patient

**How much does it cost to deliver a prehabilitation service for people with cancer?**
This will depend on current services in local areas and how services are configured and is likely to require service transformation.

**What needs to be in place for sustaining a quality prehabilitation service?**

- Senior sponsorship within the provider organisation and local leadership for the service transformation in collaboration with commissioners and alliances and cancer networks.
- Steering group to support and advise on the set up and monitoring of prehabilitation services.
- Quantitative and qualitative outcomes should be collected from the outset ie baseline data before any change and then outcomes collected following changes. These should include quality of life metrics, changes in complications, length of stay data, range of clinical outcome data, health economic data, patient satisfaction and feedback.
- Establish and agree changes to the pathway
- Establish and agree staffing required to support delivery of the service and cost.
- Establish which patients and tumour types to be targeted initially and later on.
- Ensure there is a clear project plan with achievable milestones.

**14** People with cancer as well as carers, relatives and a person's wider network should be supported to engage with and adhere to available prehabilitation services defined through a jointly agreed PPCP.

Successful prehabilitation programmes depend on changing several aspects of behaviour, including attendance at, engagement with and adherence to the exercise, nutrition and psychological components of prehabilitation. Various strategies can be used to change behaviour, also known as behaviour change techniques (BCTs)[115].

A growing body of evidence suggests an association between poor diet, smoking, alcohol consumption and low levels of physical activity and mortality following a diagnosis of cancer[116,117,118,119]. A diagnosis of cancer has been said to be a 'teachable moment'. A time at which a person may evaluate their lifestyle and be more receptive to conversations, advice and assistance in making lifestyle changes[120].

It is clear therefore, that people affected by cancer require support to engage in behaviour change. Indeed, the report from the Independent Cancer Task Force[121] recommend that all patient be given advice to improve lifestyle behaviours. We also know that people living with cancer want to be given this information and they want to hear it from their healthcare team.

Prehabilitation provides a unique opportunity to promote the importance of health behaviours in the treatment and recovery from cancer. Starting conversations about the role of lifestyle practices in the context of treatment plans gives credibility to their importance.

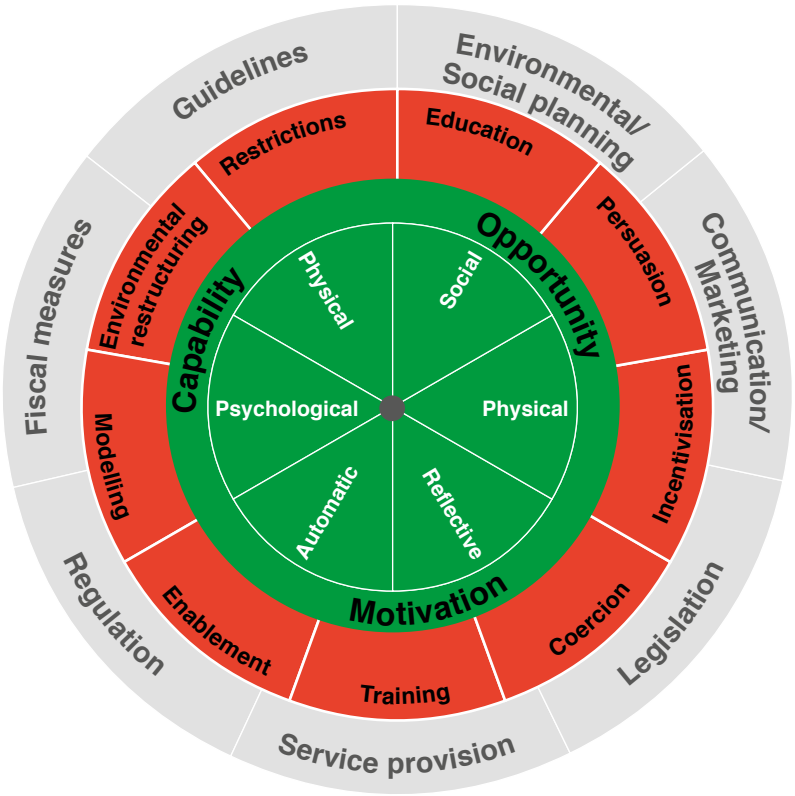
As a first step to supporting behaviour change, all health and care professionals should engage in conversations with patients regarding the importance of lifestyle behaviours. Ensuring such a consistent message is imperative and powerful. However, we know that simply providing information is not sufficient to change behaviour. In order for someone to make lasting changes to their lifestyle they have to

have the skills to do so. Behavioural change NICE guidelines set out a series of recommendations on how to support behaviour change[122]. As with all prehabilitative interventions the intensity of support required will vary and core to the NICE guidelines is the importance of a person-centred approach. This requires professionals supporting behaviour change to work collaboratively with the patient. Conversations must consider a person's needs, their social, cultural and economic context, motivation and skills. It also requires identification of potential barriers the person may face in initiating a change and maintaining that behaviour.

The Behaviour Change Wheel[123] (Figure 4) was developed from 19 frameworks of behaviour change identified in a systematic literature review. It consists of three layers.

- The hub identifies the sources of the behaviour that could prove fruitful targets for intervention. It uses the **COM-B** ('capability', 'opportunity', 'motivation' and 'behaviour') model. This model recognises that behaviour is part of an interacting system involving all these components. Interventions need to change one or more of them in such a way as to put the system into a new configuration and minimise the risk of it reverting.
- Surrounding the hub is a layer of **nine intervention functions** to choose from based on the particular COM-B analysis one has undertaken.
- The outer layer, the rim of the wheel, identifies **seven policy categories** that can support the delivery of these intervention functions.

**Figure 4: Behaviour change wheel**



**15** Services delivering prehabilitation should be co-designed and produced with patients and carers.

The co-design of services that deliver prehabilitation should be informed by both the experiences and outcomes of people living with cancer and in collaboration with the multiprofessional team. People living with cancer reported that the following helped them as they progressed from diagnosis through treatment and after treatment:

*"The fitter you are the better you are able to manage treatment"*

*"Prehabilitation needs to be tailor made for an individual and involve carers"*

*"Opportunities for people to share tips and experiences – patients need to know that they are not alone, and others are experiencing similar challenges"*

*"Patients can empower themselves"*

*"Treatment does not stop when you leave hospital"*

*"Be kind to yourself and don't look back"*

*"The offer of psychological support was appreciated"*

*"Counselling sessions"*

*"Nutrition advice"*

*"More movement"*

*"More information and emotional support. I did not realise how much Macmillan could have helped"*

*"Greater knowledge and understanding of the effect of surgery"*

*"Discussion about exercise and nutrition"*

*"Choice of one to one or group sessions"*

*"I see a role for patient advocates in this…people who are just about to start treatment…helpful for someone like me…good to go into that room and get the message across about how vital it is"*

# 9. 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 universal interventions, may be self-managed.
- Assessment and prescription (of targeted and specialist interventions) should be undertaken by registered health and care professionals.
- Universal interventions may be self-delivered or supported by any health and care professional.
- Targeted interventions may be delivered by registered health and care professionals or by unregistered professionals under delegated authority.
- Specialist intervention should be delivered by registered health and care professionals.

Prehabilitation should be delivered by a multiprofessional team that could include any of the following: allied health professionals[124], cancer exercise physiologists, cancer exercise specialists, clinical nurses specialists, doctors, fitness instructors, information and support staff, pharmacists, psychologists, rehabilitation/therapy support workers and social workers. This team may include staff that are working in the NHS, local authority, public health teams, independent and third sector. The workforce involved will be dependent on locally available staff ideally working in cancer to support the delivery of prehabilitation.

Physical activity and exercise: There is no one group of health and care professional that provides advice and deliver physical activity and exercise interventions. Specialist and targeted intervention level may be delivered by chartered physiotherapists, who use physical approaches to promote, maintain and restore wellbeing and have exercise and movement as core to their pre-registration training or by exercise physiologists or appropriately trained instructors. In addition, volunteers, support workers, fitness instructors/personal trainers and rehabilitation/therapy assistants also very often support people with physical activity and exercise.

Nutrition: Nutritional support, particularly at the targeted and specialised intervention level, would predominantly be delivered by dietitians and by members of nutrition support teams. However, many other health and care professionals can support, advocate and advise on good nutrition and health eating.

Psychological support and behaviour change: Psychologists are strongly identified as the most important professionals in the provision of psychological wellbeing, particularly in delivering targeted and specialist interventions. All health and care professionals, involved in the care of people with cancer have a role to play in promoting engagement with and adherence to prehabilitation.

It is recommended that competence is measured in health and care professionals undertaking targeted interventions and that interventions should be stratified into levels where they can be delegated to others such as unregistered staff eg rehabilitation/therapy support workers, healthcare assistants, fitness instructors. Exercise and movement are core elements of physiotherapy interventions however there is a lack of post graduate certification in oncology exercise. America have recently brought out certification for physical therapists[125] and exercise physiologists.

Competence frameworks exist for AHPs[126] and nurses[127,128] working with people living

with cancer which include guidance on the screening, assessment, treatment and monitoring people living with cancer. A needs based competence framework is being developed by Macmillan based on seven needs identified by patients: managing symptoms, pain, worry, fear and anxiety, fatigue, practical and mobility, money and insurance and making plans.

The recently published Macmillan AHP workforce survey report[129],which included dietitians, occupational therapists, physiotherapists and speech and language therapists highlighted 3%–14% of AHPs who took part in the survey intervened from diagnosis with the majority intervening from treatment and beyond. A recommendation from this report was that AHPs have a substantial role in early intervention and should be encouraged to lead service transformation in cancer care to support early intervention with people living with cancer in advance of treatment whether surgery and/or SACT and/or radiotherapy.

GPs and primary care nurses have an important role in prehabilitation. Patients attend their GP surgery throughout their cancer journey, so it is important the GP and primary care nurses have the information and knowledge around prehabilitation approaches to reinforce the message and give the correct advice and encouragement to patients.

There is no need to wait for a secondary care cancer diagnosis to start prehabilitation. It is entirely possible to start this approach much earlier at the point of referral to a fast track cancer pathway. This is a ‘teachable moment’ and a study undertaken in Wales[130] has shown advice and signposting for prehabilitation interventions at time of referral is feasible and effective. Although many of these patients will not turn out to have cancer at this time, making lifestyle changes at this point will reduce their future risk of developing cancer and other long-term conditions. In addition to primary care, other community professionals including those working at leisure centres and third sector providers can also offer support with prehabilitation interventions thus allowing these to be delivered as close to home as possible and encouraging engagement and continuation past the initial cancer scare or treatment.

# 10. Quality assurance and improvement

**17** Implementation and effectiveness should be audited as part of a quality assurance and improvement framework delivered and reported according to recognised standards. A set of standardised screening, assessment, adherence, efficacy, experience and outcome measures should be defined and used consistently within this framework.

A quality assurance and improvement framework based on comparing delivered care against an established set of standards is important to ensure consistency of delivery of high quality care. Such a framework may build on data available through established datasets or national audits (eg Hospital Episode Statistics, National Bowel Cancer Audit) and/or may involve dedicated data collection for this purpose. In the area of prehabilitation for people with cancer. The development of such a framework is an outstanding unmet need (see Action Plan).

Quality improvement is the systematic analysis of performance against agreed standards and the application of efforts to improve this performance. Quality improvement requires a thorough understanding of the healthcare environment and the systems in place and may be achieved through a variety of techniques including, for example, the application of plan-do-study-act cycles, statistical process control charts, human factors evaluations, and interventions targeting the psychology of improvement and change.

There are a number of resources available to support quality improvement. For example, the PRISM resource of the Royal College of Anaesthetists (www.prism-ed.com/home) offers resources and educational materials.

Quality assurance and quality improvement should be multi-disciplinary and multi-professional activities enabling all members of the prehabilitation team to engage with understanding current strengths and weaknesses of service delivery and to contribute to improving the quality of care delivered. Quality assurance and improvement need to be embedded into the fabric of delivered care, not considered as optional activities, if reliable systems for delivery of prehabilitation are to be sustained.

**Graham, living with cancer, Kirsty, Prehab4Cancer programme manager, June, living with cancer**

# 11. 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 in nutrition, exercise, psychology and behavioural change, should be integrated throughout the undergraduate and postgraduate training of health and care professionals working with people with cancer and other relevant training programmes.

Clinical leadership is key to the delivery of prehabilitation including effectively leading complex teams and managing multidisciplinary relationships, making the most of limited resources and being aware how leadership affects both the culture and environment of the workplace. The way that individuals manage themselves is a central part of being an effective leader[131].

Health and care professionals need to be able to talk confidently about prehabilitation and the benefits of the interventions to people living with cancer and their families, carers and friends[132,133,134,135].

In a recent paper,[136] the perspectives of health and care professionals providing lifestyle advice to people with cancer was outlined. An overarching theme in this paper was 'that health professionals desire to provide lifestyle advice' was not necessarily matched by '*knowledge and action*'.

There is global recognition that many health and care professionals are not adequately trained to address lifestyle recommendations that include nutrition and physical activity behaviours in a manner that could mitigate disease development or progression. This lack of awareness contributes to the failure to identify disease-related undernutrition, which in turn means that malnutrition frequently goes undetected, undiagnosed and untreated[137].

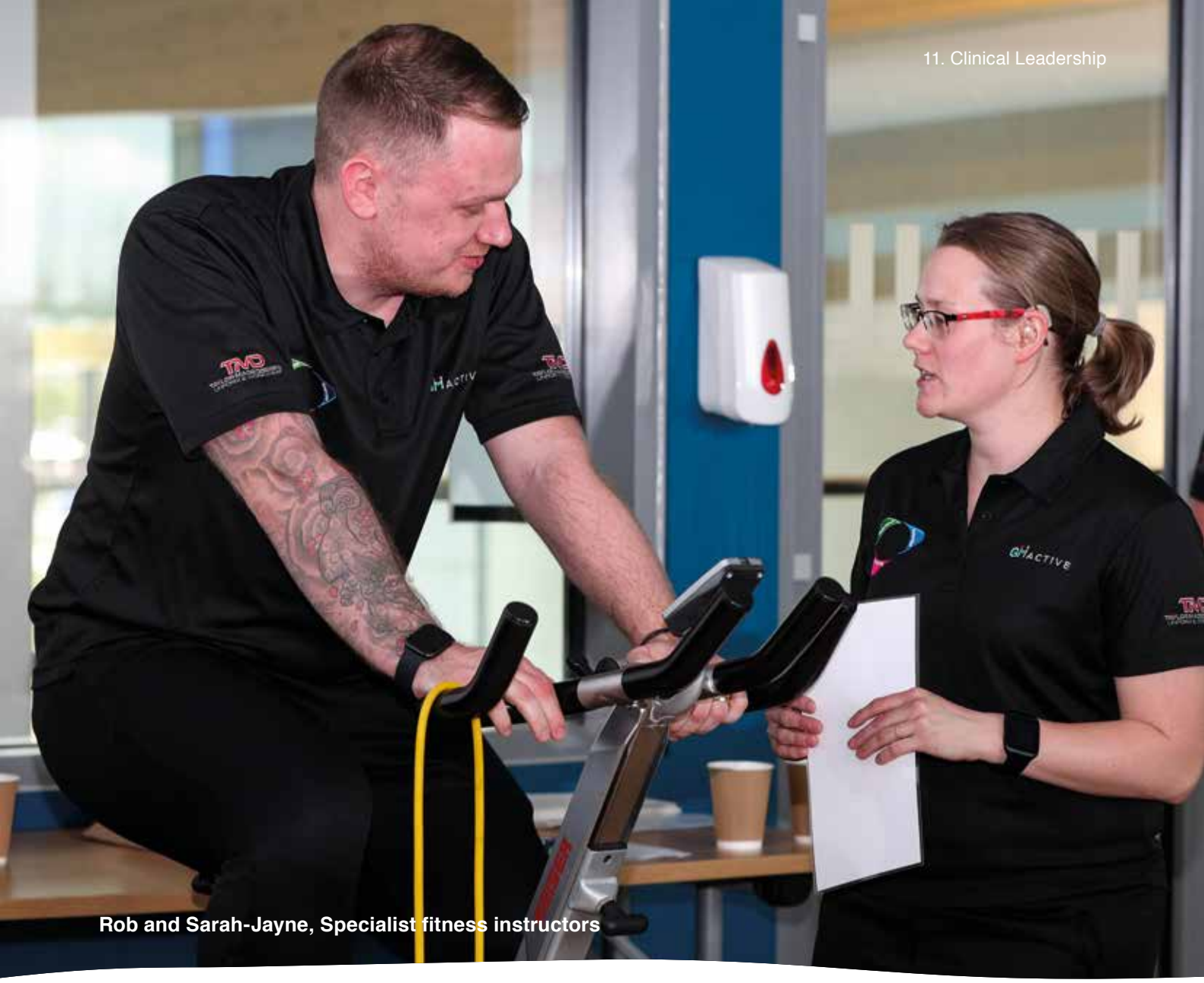
People diagnosed with cancer often experience nutrition-related problems and they do not receive consistent evidence-based advice[138]. A recent survey by the NIHR Cancer and Nutrition Collaboration demonstrated that whilst health and care professionals discuss nutritional matters with cancer patients and provide advice to people living with and beyond cancer, many lack relevant training and awareness of current guidelines[139].

NICE guidelines on how to support behaviour change[140] recommend formal training in behaviour change knowledge, skills and deliver. Training programmes should also consider where and how the intervention will be delivered (clinic, community, group or individual); the participant's background (nurse, social worker, counsellor) and whether behaviour change is integral to the participants role or an additional task. Finally, it recommends that training should include regular refresher training and in particular, opportunities to further role-play difficult scenarios that they may experience in order to improve their practice and maintain the quality of the behaviour change intervention.

At a minimum, it is recommended that health and care professionals receive training to deliver a brief intervention to motivate people to make a lifestyle change such as MECC.

The NICE Public Health Guidelines Behaviour Change: General Approaches[141] suggest that reminder systems such as *'Ask, Advise, Act'* are among the more effective methods for changing behaviour. Delivery of very brief advice (VBA) should take only 30 seconds to two minutes – which is advantageous as health and care professionals often consider time restrictions as a barrier to providing lifestyle advice. VBA has been shown to be effective at encouraging smokers to access smoking cessation services[142], however the evidence of the effectiveness of VBA on other lifestyle factors such as diet and physical activity is limited. This has been identified by NICE as a gap in the evidence.

A recent study[143,144] examined the impact, acceptability, practicability and implementation of a training intervention, designed using the Behaviour Change Wheel (Figure 3), on the delivery of VBA about physical activity by nurses to cancer patients. The 60 minute training intervention,



Rob and Sarah-Jayne, Specialist fitness instructors

delivered either face-to-face or online, incorporated behaviour change techniques such as: goal setting coupled with commitment; instructions on how to perform the behaviour; importance of the consequences of delivering VBA; and a demonstration on how to give VBA. The training intervention was both acceptable and practical to the nurses and improved their 'capability, opportunity and motivation'. This resulted in a change in knowledge, attitudes and beliefs towards physical activity and improved the quality and quantity of the VBA delivered by the nurses to the cancer patients.

Training in VBA, preferably face-to- face although online delivery modes may be useful, supports the making every contact count agenda and is relevant to all health and care professionals working in the prehabilitation setting.

Evidence shows that one in four patients would be more active if advised by a GP or nurse, yet nearly three quarters of GPs do not speak about the benefits of physical activity to patients due to either lack of knowledge, skills or confidence[145].

Public Health England in partnership with other professional bodies has established the Moving Healthcare Professionals Programme[146] to help address this barrier and support health and care professionals to promote physical activity to their patients. The programme provides peer-led training and is developing practical resources to support health and care professionals implement the NICE guidance on physical activity[147], and guidance for treatment of a breadth of conditions that recommend physical activity.

# 12. Developing the evidence base

**19** Prehabilitation interventions should be underpinned by theory and evidence. Evidence should be drawn from across the spectrum of investigation including discovery science, experimental medicine, clinical investigation, population science and implementation science as well as from quality assurance and improvement data. A gap analysis of current evidence should identify unanswered questions and inform future research priorities.

## Identifying gaps in the evidence

The evidence base for prehabilitation for people with cancer is highly variable with much more evidence available for some tumour and treatment types than others. For example, exercise interventions before major cancer surgery have received substantial attention, whereas prehabilitation before radiotherapy is relatively unexplored. The evidence landscape of prehabilitation for people with cancer should be mapped through a gap analysis across the spectrum of interventions (exercise, nutrition, psychology), treatments (surgery, SACT, radiotherapy) and cancers including indolent tumours, curable cancers and treatable but not curable cancers.

As a result of the process of development of these principles and guidance a substantial list of important research questions were identified by the expert groups and these questions are listed in the relevant expert group manuscripts and in appendix 2. These questions should be considered alongside those generated by research prioritisation exercises involving professional and patient/public involvement[148].

The themes listed in table 4 have been distilled from the list of research questions identified by the expert groups.

**Table 4: Future directions for prehabilitation research**

| |
|---|
| • Prehabilitation prior to non-surgical treatments |
| • Multi-modal prehabilitation |
| • Multiphasic prehabilitation |
| • Prehabilitation for high-risk patient groups |
| • Usability and efficacy of technology to capture and promote pre-, peri-, and post-treatment health behaviours (eg, activity trackers, virtual reality) |
| • Cost-benefit of prehabilitation implementation |
| • The impact of prehabilitation on widening access to cancer treatments that were previously inaccessible |
| • Delivery and implementation strategies (eg, home versus facility-based prehabilitation; integration into established models of care, such as ERAS) |
| • Maximum tolerable dose, minimum clinically important dose, and dose-response of prehabilitation; |
| • Interventions directed at caregivers to support the needs of people with cancer |
| • Impact of delaying treatment for prehabilitation |
| • Biopsychosocial behavioural determinants of adherence and efficacy |

**20** Evidence should be carefully, critically and systematically appraised, in the context of current experience, so that safe and effective guidance on prehabilitation can be refined and improved in order to minimises risk/harm and offers greatest benefit to patients.

## Evaluating the available evidence

The benefits of prehabilitation may be substantial to patients and to the health system. Increasing demand from both patients and service providers to make these opportunities more widely available demands that the evidence is carefully, critically and systematically appraised, in the context of current experience, so that safe and effective guidance on prehabilitation can be developed that minimises risk/harm and offers greatest benefit to patients.

The development of guidance requires an explicit statement on how the evidence was reviewed and how judgements relating to the nature, quality and strength of the evidence have been made to ensure confidence in any conclusions or recommendations. There is a recognised process that has been applied in assessing the evidence to develop recommendations relating diet, nutrition and physical activity with the development and prevention of cancer[149]. This process consists of four separate and distinct stages – hazard identification, risk analysis, risk management and policy development – and is universally acknowledged as best practice in reviewing evidence for develop recommendations and policy. In following this approach, the hazard identified is that in responding to the demand to introduce prehabilitation, there is the potential for investment in services that may not be adequately supported by evidence.

As a first step in risk analysis, the evidence underpinning these Principles and Guidance has been systematically collected, synthesised and initially appraised by an expert group using a modified Delphi process to provide a series of statements about the nature of the evidence relating to therapeutic interventions using either exercise, nutritional or psychological support, or offered together as a multimodal intervention. These summary statements, together with further stakeholder review were used to develop a series of general principles that together offer a framework that can be applied to help manage risk and maximise benefit. These principles have in turn served to help construct guidance and recommendations that will help to inform implementation and the development of policy.

Where the evidence is secure and the conclusions are justified, the primary consideration is then how best to implement the programme. However, the evidence may not always be sufficient so as to be applied universally in all contexts. Under these circumstances, it is important to acknowledge uncertainty and avoid overstating the findings and expectations with regard to policy development and implementation. For example, there may be evidence that is sufficiently strong and consistent for specific interventions in some cancers for some treatments but not necessarily all cancers and all treatments. In terms of nutritional interventions, there is secure evidence that providing pre-operative nutritional support using ONS and ANS in underweight and weight-losing patients with upper gastrointestinal cancer is associated with improved outcomes and this evidence underpins current clinical practice. However, whilst the general principle that undernourished people respond less well to systemic oncology treatments (non-surgical – chemotherapy, radiotherapy, immunotherapy) is widely acknowledged, the evidence is not yet sufficiently strong to offer a secure recommendation on how best to mitigate that risk in systemic anti-cancer treatments. In the same way, whilst there is evidence of beneficial effect in wasting or cachectic cancers, there is an absence of prehabilitation studies in many non-wasting cancers especially where the patients are overweight or obese.

The level of confidence and uncertainty regarding the evidence needs to be recognised as new services are rolled out. There is a need to work together to better organise prehabilitation services for those where the evidence is most secure, operating within a common framework that minimises risk and offers best advantage. Ensuring that the precise nature, fidelity and adherence to the intervention is determined and outcomes are reported will make it possible to see how the experience plays out in practice (eg adopting a "learning by doing" approach). As knowledge and understanding advances, services can be continually refined and improved, and where evidence is generated for a particular intervention, it may be offered to other patient groups where the evidence is less secure, but it is likely to be of benefit.


**Bob, Peggy, Tish, Sam, Sandy, Kate and Ed (left to right), WESFIT, Southampton**

# 13. Conclusions and action plan

## Conclusions

This principles and guidance document illustrates how prehabilitation can be integral in the management and support of people with cancer. The benefits of prehabilitation to commissioners, providers and people living with cancer are illustrated.

Principles about prehabilitation are provided along with a model describing screening, needs based assessment, and exercise, nutrition and psychological interventions, at a universal, targeted and specialist level.

Areas for consideration in the planning and delivery of prehabilitation as part of cancer pathways are described for use by those providing and commissioning cancer services.

It is advised that prehabilitation should be delivered by a multi-professional team working within a described framework with certain tasks and interventions requiring registered professionals with scope for delegated responsibility to the unregistered workforce (as well as care givers, family members and others).

The evidence for the effectiveness of prehabilitation interventions before cancer treatment is stronger in some areas than others[150,151], which is why the importance of building on the current evidence base is emphasised. Research questions are presented as identified from the development of these principles and guidance for the future.

The importance of implementation monitoring, quality assurance and quality improvement is also highlighted along with the need for standardisation of screening and assessment adherence, efficacy and outcome reporting. The development of the appropriate workforce is also more established in some areas than others such as dietitians working with those with specific tumour types.

Importantly, effective delivery of prehabilitation for people with cancer does not require the invention of a whole new set of skills, rather it is about the application of generic skills to a specific context. In different settings, these skills may be available through established services focussing on other long-term conditions (eg pulmonary/cardiac rehabilitation) or in developing new services (eg perioperative medicine).

We have tried to propose a framework for implementation building on innovative work nationally and internationally. The emphasis should be on modifying pathways, not targets and allowing the money to flow as new models of care develop and increasingly target overall patient health and well-being, rather than resolution of specific clinical problems.

Delivery of prehabilitation for people with cancer requires valuable transferable skills that will be of benefit for all health and care professionals and their patients and contribute to building a workforce focussed on consistent improvements in health.

Clinical leadership and advocacy is essential for the spread and adoption of these principles and guidance and for the further development of prehabilitation for people living with cancer. Health and care professionals should understand and communicate the importance of prehabilitation through leadership and advocacy. 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.

## Action plan

**1 Integrate prehabilitation into the established clinical pathways for people with cancer, including integration of screening questions into holistic needs assessments (including the Macmillan Holistic Needs Assessment), inclusion of the interventions into treatment summaries where appropriate and follow-up and monitoring by primary care providers managing cancer as a long term condition.**

**2 Gather examples of how local areas have had prehabilitation commissioned as part of the cancer pathway.**

**3 Gather examples of personalised prehabilitation care plans (PPCP).**

**4 Develop a "Community of Practice" resource to provide contacts of local/regional sites and share expertise and learning from established prehabilitation programmes.**

The development of these principles and guidance have enabled experts from across the UK and internationally to come together to discuss, progress and agree the way forward for prehabilitation as part of the cancer pathway.

This is very much a 'live' journey for all involved in this work. There has been an identified need to continue to bring health and care professionals together from across all sectors and settings to share and learn from each other's experiences of planning and delivering prehabilitation for people living with cancer as well as pooling and sharing data.

It is anticipated that there will be a lot of interest in these principles and guidance across the UK and wider therefore it is proposed that a community of practice[152] is established to support the work going forward. It is anticipated that this will start as a virtual community accessed through the designated webpages on the Macmillan website for prehabilitation.

The original steering group set up for the development of the guidance will be reviewed and continue with a revised terms of reference to support the community of practice and the sharing and learning from each other.

**5 Work with relevant registered and unregistered professional groups to define a competence and training framework for professionals in prehabilitation.**

**6 Work with the Professional Standards Authority (PSA), the Chartered Institute for the Management of Sport and Physical Activity (CIMPSA) and the British Association of Sport and Exercise Sciences (BASES) to define an approach to achieving accreditation and/or regulation for exercise professionals in prehabilitation.**

As highlighted for physical activity and exercise there is no one health and care professional who predominantly could or does provide advice and deliver physical activity and exercise interventions. Statutory regulation is not needed for all professionals working in health and care. Assured registration is an alternative, voluntary system that enables employers to specify a desired characteristic required of the workforce. The Academy of Health Sciences is exploring credentialing for such professions. The Professional Standards Authority has an established and tested method for making a risk-based assessment to discriminating between professions requiring regulated or assured registered status. It is planned that this discussion will be progressed.

**7 Develop a quality assurance and quality improvement framework and advocate for the inclusion of relevant data in established national audits.**

Implementation and effectiveness should be audited as part of quality assurance and improvement framework delivered and reported according to recognised standards.

**8** **Develop a standardised set of validated screening, assessment, adherence, efficacy and outcome measures.**

A set of standardised screening, assessment, adherence, efficacy and outcome measures should be defined and used consistently within an quality assurance and improvement framework.

**9** **Conduct a gap analysis of current evidence to identify future research priorities and maintain this resource.**

The evidence base is highly variable with much more evidence available for some tumour and treatment types than others. This landscape should be mapped through a gap analysis including indolent tumours, curable cancers and treatable but not curable cancers.

**10** **Pursue a prehabilitation research agenda in partnership with relevant stakeholders including: National Institute for Health Research (NIHR), Cancer Research UK (CR-UK) and the National Cancer Research Institute (NCRI)**

Recruitment of patients with a diagnosis into clinical research studies in England is continuing to rise and it is now accepted that every patient living with cancer should have the opportunity to contribute to a research study.

Prehabilitation interventions should be underpinned by theory and evidence. Development of prehabilitation should be through an evidence informed process involving implementation science, service development, population science, clinical investigation and basic discovery science.

**11** **Pursue the health economic evaluation of prehabilitation programmes to inform the development of viable business cases for prehabilitation. The health economics evaluation should take account of short- (eg tolerance of treatment) and long- (eg healthy behaviours resulting in improved long-term health) term outcomes.**

It is fully acknowledged that work is required to better understand the health economics associated with prehabilitation. This work will be developed by Macmillan, the RCoA and the NIHR Cancer and Nutrition collaboration with the development of an agreed approach. It is proposed that there is agreement between service providers that are already delivering prehabilitation as part of the cancer pathway for patients to pool data across areas of the country to support this work.

# References


1 Faithfull S, Turner L, Poole K, et al. (2019) Prehabilitation for adults diagnosed with cancer: A systematic review of long-term physical function, nutrition and patient-reported outcomes. Eur J Cancer Care ;e13023. https://doi.org/10.1111/ecc.13023.

2 Santa – Mina, D, Langelier, D, Adams, S.C, Alibhai, S.M.H., Clasen, M and Campbell, K.L (2018) Exercise as part of routine cancer care. www.thelancet.com/journals/lanonc/article/PIIS1470-2045(18)30599-0/fulltext

3 Cave, J, Paschalis, A & Huang, C.Y, West. M, Copson. E, Jack, S and & M. P. W. Grocott, M.P.W (2018) A systematic review of the safety and efficacy of aerobic exercise during cytotoxic chemotherapy treatment.

4 Macmillan Cancer Support (2017) Physical activity in people with metastatic bone disease. www.macmillan.org.uk/_images/physical-activity-for-people-with-metastatic-bone-disease-guidance_tcm9-326004.pdf

5 Cancer outcomes and services Data Set. www.ncin.org.uk/collecting_and_using_data/data_collection/cosd

6 Scottish cancer registration scheme. www.isdscotland.org/Health-Topics/Cancer.

7 www.wales.nhs.uk/healthtopics/conditions/cancer

8 Macmillan cancer support (2017) Prehabilitation evidence and insight report. www.macmillan.org.uk/_images/prehabilitation-evidence-and-insight-review_tcm9-335025.pdf

9 Independent taskforce (2015) Achieving world class cancer outcomes: a strategy for England 2015–2020. www.cancerresearchuk.org/sites/default/files/achieving_world-class_cancer_outcomes_-_a_strategy_for_england_2015-2020.pdf

10 NHS England (2019) NHS Long Term Plan.

11 www.macmillan.org.uk/about-us/health-professionals/programmes-and-services/recovery-package

12 Carli, F et al (2016) Surgical Prehabilitation in Patients with Cancer State-of-the-Science and Recommendations for Future Research from a Panel of Subject Matter Experts. Physical Medicine and Rehabilitation Clinics of North America 28(1):49–64. February 2017.

13 Centre for Perioperative Care www.rcoa.ac.uk/cpoc

14 National Institute for Health Research (2015) Cancer and Nutrition NIHR infrastructure collaboration. Report of Phase 1. https://cancerandnutrition.nihr.ac.uk/wp-content/uploads/2016/06/Cancer-Nutrition-Full-Report-FINAL_03-06-16.pdf

15 The evidence base rewiewed was based on those 18 years old and above.

16 Independent taskforce (2015) Achieving world class cancer outcomes: a strategy for England 2015–2020. www.cancerresearchuk.org/sites/default/files/achieving_world-class_cancer_outcomes_-_a_strategy_for_england_2015-2020.pdf

17 Macmillan Cancer Support (2018) Cancer Rehabilitation Pathways. www.macmillan.org.uk/assets/macmillan-cancer-rehabilitation-pathways.pdf

18 Macmillan Cancer Support (2013) Throwing light on the consequences of cancer and its treatment. www.macmillan.org.uk/documents/aboutus/research/researchandevaluationreports/throwinglightontheconsequencesofcanceranditstreatment.pdf

19 Maddams J, Utley M, Møller H. Projections of cancer prevalence in the United Kingdom, 2010–2040. Br J Cancer 2012; 107: 1195–1202.

20 2016 incidence figures compiled for each nation from Office for National Statistics, ISD Scotland, Welsh Cancer Intelligence and Surveillance Unit and Northern Ireland Cancer Registry. Figures include all malignant neoplasms excluding non-melanoma skin cancer (NMSC) (ICD-10 codes C00-97 excl. C44. Scotland does not use C97).

21 Maddams J, Utley M, Møller H. Projections of cancer prevalence in the United Kingdom, 2010–2040. Br. J. Cancer 2012;107:1195–202.

22 NHS England GP contract 31.1.19 www.england.nhs.uk/wp-content/uploads/2019/01/gp-contract-2019.pdf

23 Meyerhardt JA, Giovannucci EL, Holmes MD, Chan AT, Chan JA, Colditz GA, Fuchs CS. (2006) Physical activity and survival after colorectal cancer diagnosis. J Clin Oncol; 24:3527–34.

24 Macmillan Cancer Support (2019) Health Inequalities: Time to talk.

25 Getting it Right First Time. https://gettingitrightfirsttime.co.uk/surgical-specialty/breast-surgery

26 Wales Cancer Network (2016) Cancer Delivery Plan for Wales 2016–2020. www.walescanet.wales.nhs.uk/sitesplus/documents/1113/Cancer%20Delivery%20Plan%202016-2020.pdf

27 NHS Wales (2015) Our plan for a primary care service for Wales up to March 2018. www.wales.nhs.uk/sitesplus/documents/986/Our%20Plan%20for%20Primary%20Care%20in%20Wales%20up%20to%20March%202018.pdf

28 Barlow, R. C.et al. (2018) Fit for Cancer Treatment: a prospective feasibility study of primary care initiated prehabilitation for patients with suspected cancer. BJGP Open, pp. -., article number: 18X101608. (10.3399/bjgpopen18X101608).

29 Scottish Government (2016) Beating cancer. Ambition and Action. www.gov.scot/publications/beating-cancer-ambition-action/pages/7

30 NHS Health Scotland (2018) New Public Health Priorities for a healthier nation. www.healthscotland.scot/news/2018/june/new-public-health-priorities-for-a-healthier-nation

31 www.nursingtimes.net/news/cancer/cno-to-lead-development-of-northern-ireland-cancer-plan/7028975.article?blocktitle=news&contentid=27549

32 Macmillan Cancer Support (2017) Physical activity and cancer: A concise evidence review. www.macmillan.org.uk/_images/the-importance-physical-activity-for-people-living-with-and-beyond-cancer_tcm9-290123.pdf

33 Jones, L. W., Haykowsky, M., Pituskin, E. N., Jendzjowsky, N. G., Tomczak, C. R., Haennel, R. G. & Mackey, J. R. (2007) Cardiovascular reserve and risk profile of postmenopausal women after chemoendocrine therapy for hormone receptor--positive operable breast cancer. Oncologist, 12, 1156–64.

34 West, M. A., Asher, R., Browning, M., Minto, G., Swart, M., Richardson, K., Mcgarrity, L., Jack, S., Grocott, M. P. (2016) Perioperative Exercise, T. & Training, Validation of preoperative cardiopulmonary exercise testing-derived variables to predict in-hospital morbidity after major colorectal surgery. Br J Surg, 103, 744–75.

35 Herrero, F., Balmer, J., San Juan, A. F., Foster, C., Fleck, S., Perez, M., Canete, S., Earnest, C. P. & Lucia, A. (2006) Is cardiorespiratory fitness related to quality of life in survivors of breast cancer? Journal Strength and Conditioning Research, 20, 535–540.

36 Alfano, C., Smith, A., Irwin, M., Bowen, D., Sorensen, B., Reeve, B., Meeske, K., Bernstein, L., Baumgartner, K., Ballard-Barbash, R., Malone, K. & Mctiernan, A. (2007) Physical activity, long-term symptoms, and physical health-related quality of life among breast cancer survivors: A prospective analysis. Journal of Cancer Survivorship, 1, 116–128.

37 Jones, L. W., Courneya, K. S., Mackey, J. R., Muss, H. B., Pituskin, E. N., Scott, J. M., Hornsby, W. E., Coan, A. D., Herndon, J. E., 2nd, Douglas, P. S. & Haykowsky, M. (2012) Cardiopulmonary function and age-related decline across the breast cancer survivorship continuum. Journal of Clinical Oncology, 30, 2530–7.

38 Lakoski, S. G., Willis, B. L., Barlow, C. E., Leonard, D., Gao, A., Radford, N. B., Farrell, S. W., Douglas, P. S., Berry, J. D., Defina, L. F. & Jones, L. W. (2015) Midlife Cardiorespiratory Fitness, Incident Cancer, and Survival After Cancer in Men: The Cooper Center Longitudinal Study. JAMA Oncol, 1, 231–7.

39 Chang, C. K., Hayes, R. D., Broadbent, M. T., Hotopf, M., Davies, E., Moller, H. & Stewart, R. (2014) A cohort study on mental disorders, stage of cancer at diagnosis and subsequent survival. BMJ Open, 4, e004295.

40 Foster, C et al (2016) Pre-Surgery Depression and Confidence to Manage Problems Predict Recovery Trajectories of Health and Wellbeing in the First Two Years following Colorectal Cancer: Results from the CREW Cohort Study https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0155434

41 Grimmett, C (2017) Colorectal cancer patient's self-efficacy for managing illness-related problems in the first 2 years after diagnosis, results from the ColoREctal Well-being (CREW) study. J Cancer Surviv. Oct;11(5):634–642. www.ncbi.nlm.nih.gov/pubmed/28822053

42 Batty, G. D., Russ, T. C., Stamatakis, E., & Kivimäki, M. (2017). Psychological distress in relation to site specific cancer mortality: pooling of unpublished data from 16 prospective cohort studies. *bmj*, 356, j108.

43 Robson, A, Scrutton, F, Wilkinson, L and Macleod, F (2010) The risk of suicide in cancer patients: a review of the literature. https://onlinelibrary.wiley.com/doi/full/10.1002/pon.1717

44 Arends J, Bachmann P, Baracos V, Barthelemy N, Bertz H, Bozzetti F, Fearon K, Hütterer E, Isenring E, Kaasa S, Krznaric Z, Laird B, Larsson M, Laviano A, Mühlebach S, Muscaritoli M, Oldervoll L, Ravasco P, Solheim T, Strasser F, de van der Schueren M, Preiser JC. (2017) ESPEN guidelines on nutrition in cancer patients. Clin Nutr. 2017 Feb;36(1):11–48.

45 Arends J, Baracos V, Bertz H, Bozzetti F, Calder PC, Deutz NEP, Erickson N, Laviano A, Lisanti MP, Lobo DN, McMillan DC, Muscaritoli M, Ockenga J, Pirlich M, Strasser F, de van der Schueren M, Van Gossum A, Vaupel P, Weimann A. (2017) ESPEN expert group recommendations for action against cancer-related malnutrition. Clin Nutr. Oct;36(5):1187–1196.

46 Weimann A, Braga M, Carli F, Higashiguchi T, Hübner M, Klek S, Laviano A, Ljungqvist O, Lobo DN, Martindale R, Waitzberg DL, Bischoff SC, Singer P. (2017) ESPEN guideline: Clinical nutrition in surgery. Clin Nutr. Jun;36(3):623–650.

47 Farhangfar A, Makarewicz M, Ghosh S, Jha N, Scrimger R, Gramlich L, et al. (2014) Nutrition impact symptoms in a population cohort of head and neck cancer patients: multivariate regression analysis of symptoms on oral intake, weight loss and survival. Oral Oncol;50(9):877e83.

48 Aaldriks AA, van der Geest LG, Giltay EJ,l e Cessie S, Portielje JE, Tanis BC, etal. (2013) Frailty and malnutrition predictive of mortality risk in older patients with advanced colorectal cancer receiving chemotherapy. J Geriatr Oncolb;4(3):218e26.

49 Mitsuru Tashiro, Suguru Yamada, Tsutomu Fujii, Norifumi Hattori, Hideki Takami, Masaya Suenaga, Yukiko Niwa, Masamichi Hayashi, Naoki Iwata, Mitsuro Kanda, Chie Tanaka, Daisuke Kobayashi, Goro Nakayama, Hiroyuki Sugimoto, Masahiko Koike, Michitaka Fujiwara, and Yasuhiro Kodera. (2018) Clinical implication of nutrition for neoadjuvant therapy and impact of nutritional support in pancreatic cancer. Journal of Clinical Oncology. 36:4_suppl, 416–416.

50 There are inherent risks with some interventions. Patients should be screened and assessed on a individual basis to ensure the most appropriate interventions are prescribed.

51 Loughney, L., West, M. A., Kemp, G. J., Grocott, M. P. & Jack, S. 2015. Exercise intervention in people with cancer undergoing neoadjuvant cancer treatment following surgery: A systematic review. Eur J Surg Oncol, 41, 1590–602.

52 Cavalheri, V., Tahirah, F., Nonoyama, M., Jenkins, S. & Hill, K. (2014) Exercise training for people following lung resection for non-small cell lung cancer – A Cochrane systematic review. *Cancer Treat Rev*, 40, 585–594.

53 Hijazi, Y., Gondal, U. & Aziz, O. (2017) A systematic review of prehabilitation programs in abdominal cancer surgery. Int J Surg, 39, 156–162.

54 Chang, J. I., Lam, V. & Patel, M. I. (2016) Preoperative Pelvic Floor Muscle Exercise and Postprostatectomy Incontinence: A Systematic Review and Meta-analysis. Eur Urol, 69, 460–7.

55 de van der Schueren MAE, Laviano A, Blanchard H, Jourdan M, Arends J, Baracos VE. Systematic review and meta-analysis of the evidence for oral nutritional intervention on nutritional and clinical outcomes during chemo(radio)therapy: current evidence and guidance for design of future trials. Ann Oncol. 2018 May 1;29(5):1141–1153.

56 Tsimopoulou I, Pasquali S, Howard R, Desai A, Gourevitch D, Tolosa I, et al. (2015) Review of psych interventions in cancer prehab: Psychological Prehabilitation Before Cancer Surgery: A Systematic Review. Annals of surgical oncology. 22(13):4117–23.

57 Sanjida, S., McPhail, S. M., Shaw, J., Couper, J., Kissane, D., Price, M. A., & Janda, M. (2018). Are psychological interventions effective on anxiety in cancer patients? A systematic review and meta-analyses. *Psycho-Oncology*, 27(9), 2063–2076.

58 Diez JH (1969) Jr Rehabilitation of the cancer patients *Med Clin North Am* 1696, vol. 53 (pg. 607–24).

59 Silva, J.K and Baima, J (2013) 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. Aug;92(8):715–27.

60 www.macmillan.org.uk/about-us/health-professionals/programmes-and-services/recovery-package#297633

61 Caspersen, C.J., Powell, K.E. and Christenson, G.M (1985) Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. Public Health Rep. Mar–Apr; 100(2): 126–131. www.ncbi.nlm.nih.gov/pmc/articles/PMC1424733.

62 Santa – Mina, D, Langelier, D, Adams, S.C, Alibhai, S.M.H., Clasen, M and Campbell, K.L (2018) Exercise as part of routine cancer care. www.thelancet.com/journals/lanonc/article/PIIS1470-2045(18)30599-0/fulltext

63 Cave, J, Paschalis, A & Huang, C.Y, West. M, Copson. E, Jack, S and & M. P. W. Grocott, M.P.W (2018) A systematic review of the safety and efficacy of aerobic exercise during cytotoxic chemotherapy treatment.

64 Hagströmer, M., Oja, P. & Sjöström, M. (2006) The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity. *Public Health Nutrition*, 9, 755–762.

65 www.healthscotland.scot/health-topics/physical-activity/screening-for-physical-activity-levels-using-scot-pasq

66 Amireault, S, Godin, G, Lacombe, J and Sabiston, C.M. (2015) The use of the Godin-Shephard Leisure-Time Physical Activity Questionnaire in oncology research: a systematic review. BMC Medical Research Methodology 15:60 https://bmcmedresmethodol.biomedcentral.com/track/pdf/10.1186/s12874-015-0045-7?site=bmcmedresmethodol.biomedcentral.com

67 www.gov.uk/government/publications/general-practice-physical-activity-questionnaire-gppaq

68 http://exerciseismedicine.com.au/wp-content/uploads/2016/11/EIM-fact-sheet-Physical-activity-stage-of-change.pdf

69 Simmonds, M. (2002). Physical Function in Patients with Cancer: Psychometric Characteristics and Clinical Usefulness of a Physical Performance Test Battery. Journal Pain and Symptom Management, 24, 404–414.

70 Gresham et al (2018) Wearable activity monitors in oncology trials: Current use of an emerging technology. Contemporary Clinical Trials. Vol 64. Pp 13 – 21. www.sciencedirect.com/science/article/pii/S1551714417304731

71 Kenneth Rockwood, Xiaowei Song, Chris MacKnight, Howard Bergman, David B. Hogan, Ian McDowell and Arnold Mitnitski. (2005) A global clinical measure of fitness and frailty in elderly people CMAJ August 30,173 (5) 489–495; DOI: https://doi.org/10.1503/cmaj.050051

72 www.calculators.tech/6-minute-walk-test-distance

73 www.ncbi.nlm.nih.gov/pmc/articles/PMC2644568

74 www.ons.org/sites/default/files/TUG_Test-a.pdf

75 www.cdc.gov/steadi/pdf/STEADI-Assessment-30Sec-508.pdf

76 www.bapen.org.uk/pdfs/must/must-full.pdf

77 Shaw, C et al (2014) Comparison of a novel, simple nutrition screening tool for adult oncology inpatients and the Malnutrition Screening Tool (MST). Support care cancer.

78 Fergusson M. L. (1999) Development of a valid and reliable Malnutriition Screening tool for adult acute hospital patients. Nutrition. Vol.15.No.6.

79 Gabrielson, D.K. (2013) Use of an Abridged Scored Patient-Generated Subjective Global Assessment (abPG-SGA) as a Nutritional Screening Tool for Cancer Patients in an Outpatient Setting. Nutrition and cancer. Vol.65, Issue 2.

80 Read J, A et al (2005) Nutritional assessment in cancer: comparing the Mini-Nutritional Assessment (MNA) with the scored Patien Generated Subjective Global Assessment (PGSGA). Nutr Cancer 53(1):51–56.

81 https://patient.info/doctor/patient-health-questionnaire-phq-9

82 https://patient.info/doctor/generalised-anxiety-disorder-assessment-gad-7

83 https://www.gl-assessment.co.uk/products/hospital-anxiety-and-depression-scale-hads

84 https://euroqol.org/eq-5d-instruments/eq-5d-3l-about

85 https://qol.eortc.org/questionnaire/eortc-qlq-c30

86 www.mdanderson.org/research/departments-labs-institutes/departments-divisions/symptom-research/symptom-assessment-tools/brief-fatigue-inventory.html

87 https://qol.eortc.org/questionnaire/qlq-fa12

88 www.kingsfund.org.uk/publications/supporting-people-manage-their-health

89 www.calculators.tech/6-minute-walk-test-distance

90 www.ons.org/sites/default/files/TUG_Test-a.pdf

91 www.hqsc.govt.nz/assets/Falls/PR/005-falls-toolkit-chair-stand-test.pdf

92 www.hqsc.govt.nz/assets/Falls/PR/005-falls-toolkit-chair-stand-test.pdf

93 www.inetsolutions.com.au/workhab/help/Step%20test.htm

94 British Dietetics Association (BDA) (2012) Model and Process for Nutrition and Dietetic Practice. www.bda.uk.com/publications/professional/model

95 www.macmillan.org.uk/information-and-support/coping/maintaining-a-healthy-lifestyle

96 www.macmillan.org.uk/information-and-support/coping/side-effects-and-symptoms/breathlessness

97 NHS Choices www.nhs.uk/oneyou

98 https://movingmedicine.ac.uk

99 www.makingeverycontactcount.co.uk

100 MECC. How NICE resources can support local priorities. https://stpsupport.nice.org.uk/mecc/index.

101 Nelson et al (2013). Make every contact count. An Evaluation. www.makingeverycontactcount.co.uk/media/1063/article-on-mecc-evaluation-2013.pdf

102 https://portal.e-lfh.org.uk/Catalogue/Index?HierarchyId=0_35136_35137&programmeId=35

103 Public Health England (2015) All our Health: personalised care and population health www.gov.uk/government/collections/all-our-health-personalised-care-and-population-health

104 Health Education England, Skills for Health & Skills for Care (2017) Framework for Person Centred Approaches in Healthcare Web page accessed August 2017 www.skillsforhealth.org.uk/news/latest-news/item/576-new-framework-to-promote-personcentred-approaches-in-healthcare

105 Schmitz et al (2010) American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. Med Sci Sports Exercise. Jul;42(7):1409–26.

106 https://be.macmillan.org.uk/be/s-840-move-more.aspx

107 https://iddsi.org/resources

108 Nagpal et al (2017) Measuring Adherence to a Nutrition and Exercise Lifestyle Intervention: Is Program Adherence Related to Excessive Gestational Weight Gain? Behaviour analysis practice. 10. pp. 347–54. https://link.springer.com/article/10.1007/s40617-017-0189-5

109 NHS England (2018) Commissioning Guidance for Rehabilitation. www.england.nhs.uk/wp-content/uploads/2016/04/rehabilitation-comms-guid-16-17.pdf

110 Wales Cancer Network (2016) Cancer Delivery Plan for Wales 2016 – 2020. www.walescanet.wales.nhs.uk/sitesplus/documents/1113/Cancer%20Delivery%20Plan%202016-2020.pdf

111 Scottish Government (2016) Beating cancer. Ambition and Action. www2.gov.scot/resource/0049/00496709.pdf

112 NHS Health Scotland (2018) New Public Health Priorities for a healthier nation. www.healthscotland.scot/news/2018/june/new-public-health-priorities-for-a-healthier-nation

113 Transforming Cancer Services Team (2019) Service improvement tools. www.macmillan.org.uk/_images/service-improvement-tools-for-cancer-rehabilitation-report_tcm9-344180.pdf

114 Silver, J.K. and Baima, J (2013) Cancer Prehabilitation An Opportunity to Decrease Treatment-Related Morbidity, Increase Cancer Treatment Options, and Improve Physical and Psychological Health Outcomes. American Journal of Physical Medicine & Rehabilitation. Vol. 92, No. 8, August. Pp 715–727. www.integrativeoncology-essentials.com/wp-content/uploads/2013/08/Cancer-Prehabilitation-paper.pdf

115 Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W.,Wood, C. E. (2013). The behaviour change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behaviour change interventions. *Annals of behavioral medicine*, 46(1), 81–95.

116 Mayne ST, Cartmel B, Kirsh V, Goodwin WJ, Jr. (2009) Alcohol and tobacco use prediagnosis and postdiagnosis, and survival in a cohort of patients with early stage cancers of the oral cavity, pharynx, and larynx. Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology.;18(12):3368–74.

117 Meyerhardt JA, Giovannucci EL, Holmes MD, Chan AT, Chan JA, Colditz GA, et al. Physical activity and survival after colorectal cancer diagnosis. (2006) Journal of clinical oncology: official journal of the American Society of Clinical Oncology.24(22):3527–34.

118 Meyerhardt JA, Niedzwiecki D, Hollis D, Saltz LB, Hu FB, Mayer RJ, et al. (2007) Association of dietary patterns with cancer recurrence and survival in patients with stage III colon cancer. Jama. 298(7):754–64

119 McTiernan A, Irwin M, Vongruenigen V. (2010) Weight, physical activity, diet, and prognosis in breast and gynecologic cancers. Journal of clinical oncology: official journal of the American Society of Clinical Oncology. 28(26):4074–80.

120 Demark-Wahnefried W, Aziz NM, Rowland JH, Pinto BM. Riding the crest of the teachable moment: promoting long-term health after the diagnosis of cancer. (2005) Journal of clinical oncology: official journal of the American Society of Clinical Oncology. 23(24):5814–30.

121 Independent taskforce (2015) Achieving world class cancer outcomes: a strategy for England 2015–2020. www.cancerresearchuk.org/sites/default/files/achieving_world-class_cancer_outcomes_-_a_strategy_for_england_2015-2020.pdf

122 National Institute for Health and Care Excellence (2014) Behavioural change: Individual approaches. www.nice.org.uk/Guidance/PH49

123 www.behaviourchangewheel.com/about-wheel

124 AHPs including dietitians, occupational therapists, physiotherapists, and speech and language therapists.

125 American Board of Physical Therapy Specialists (2019) Oncology specialist certification candidate guide. www.abpts.org/uploadedFiles/ABPTSorg/Specialist_Certification/Oncology/SpecCert_Oncology_Application.pdf

126 Macmillan Cancer Support (2017) Macmillan Allied Health Professionals competence framework for working with people affected by cancer. www.macmillan.org.uk/_images/allied-health-professions-framework_tcm9-314735.pdf

127 Macmillan Cancer Support (2014) A competence framework for nurses: Caring for patients living with and beyond cancer. www.macmillan.org.uk/_images/competence-framework-for-nurses_tcm9-297835.pdf

128 Royal College of Nursing (2017) Career and education framework for cancer nursing. www.rcn.org.uk/professional-development/publications/pub-005718

129 Macmillan Cancer Support (2018) Allied Health Professional Workforce Survey Report. www.macmillan.org.uk/_images/allied-health-professional-workforce-report_tcm9-344100.pdf

130 Barlow, R. C.et al. (2018) Fit for Cancer Treatment: a prospective feasibility study of primary care initiated prehabilitation for patients with suspected cancer. BJGP Open, pp. -., article number: 18X101608. (10.3399/bjgpopen18X101608).

131 Macmillan Cancer Support (2018) The Macmillan Allied Health Professions Competence Framework www.macmillan.org.uk/_images/allied-health-professions-framework_tcm9-314735.pdf

132 Macmillan Cancer Support (2017) Prehabilitation evidence and insight report. www.macmillan.org.uk/_images/prehabilitation-evidence-and-insight-review_tcm9-335025.pdf

133 Ball L, Barnes K, Laur C,, Crowley J, Ray S. (2016) Setting priorities for research in medical nutrition education: an international approach. BMJ Open. Dec 14;6(12):e013241. doi: 10.1136/bmjopen-2016-013241.

134 Marples O, Baldwin C, Weekes CE. (2017) The effect of nutrition training for health care staff on learner and patient outcomes in adults: a systematic review and meta-analysis. Am J Clin Nutr. Jul;106(1):284–310. doi: 10.3945/ajcn.116.144808. Epub 2017 May 24.

135 Kris-Etherton PM1, Akabas SR, Bales CW, Bistrian B, Braun L, Edwards MS, Laur C, Lenders CM, Levy MD, Palmer CA, Pratt CA, Ray S, Rock CL, Saltzman E, Seidner DL, Van Horn L. (2014) The need to advance nutrition education in the training of health care professionals and recommended research to evaluate implementation and effectiveness. Am J Clin Nutr. May;99(5 Suppl):1153S–66S.

136 Koutoukidis DA, Lopes S, Fisher A, et al (2018) Lifestyle advice to cancer survivors: a qualitative study on the perspectives of health professionals. *BMJ Open* 2018;8:e020313. doi: 10.1136/bmjopen–2017–020313 https://bmjopen.bmj.com/content/8/3/e020313

137 Jackson AA. Human nutrition in medical practice: the training of doctors. (2001) Proc Nutr Soc. May;60(2):257–63.

138 Beeken RJ, Williams K, Wardle J, Croker H. (2016) "What about diet?" A qualitative study of cancer survivors' views on diet and cancer and their sources of information. Eur J Cancer Care (Engl). Sep;25(5):774–83. doi: 10.1111/ecc.12529. Epub Jun 28.

139 B.M. Corfe, J.L. Murphy, F.P. Davey, L.J. Miller, M.A. Lloyd, S. Burden, F. Munir, T. Wiseman, M. Barrett and S.A. Wootton. (2018) Nutritional screening, assessment and provision of advice for people living with and beyond cancer – a UK survey of clinicians. Proceedings of the Nutrition Society, 77 (OCE1), E25.

140 National Institute for health and Care Excellence (2014) Public Health Guideline 49. Behaviour change Individual approaches. www.nice.org.uk/Guidance/PH49

141 National Institute for Health and Care excellence (2007)Public Health Guidelines 7. Behaviour Changes. General Approaches. www.nice.org.uk/Guidance/PH6

142 National Centre for Smoking Cessation and Training (2014).

143 Webb, J., Foster, J. & Poulter, E. (2016a) Increasing the frequency of physical activity very brief advice for cancer patients. Development of an intervention using the behaviour change wheel. Public Health, 133, 45–56.

144 Webb, J., Hall, J., Hall, K. & Fabunmi-Alade, R. (2016b) Increasing the frequency of physical activity very brief advice by nurses to cancer patients. A mixed methods feasibility study of a training intervention. Public Health, 139, 121–133.

145 www.dailymail.co.uk/health/article-6279627/GPs-urged-tell-patients-exercise-theyre-seriously-ill.html

146 www.sportengland.org/our-work/health-and-inactivity/moving-healthcare-professionals

147 National Institute for Health and Care Excellence www.nice.org.uk/Guidance/Lifestyle-and-wellbeing/Physical-activity/products?ProductType=Guidance&Status=Published

148 www.ncri.org.uk/lwbc

149 www.wcrf-uk.org/uk/our-research/our-continuous-update-project

150 A. Rodriguez-Larrad; I. Lascurain-Aguirrebena; L. C. Abecia-Inchaurregui; J. Seco (2014) Perioperative physiotherapy in patients undergoing lung cancer resection. Interactive Cardiovascular and Thoracic Surgery.

151 L. S. Hoon; C. W. C. Sally; H. Hong-Gu (2013) Effect of psychosocial interventions on outcomes of patients with colorectal cancer: A review of the literature. Vol. 17. Issue 6. 883–891.

152 Informal, self-organised, network of peers with diverse skills and experience in an area of practice or profession. Such groups are held together by the members' desire to help others (by sharing information) and the need to advance their own knowledge (by learning from others).

# Appendices

## Appendix 1: Stakeholder engagement

### Steering Group membership

| Name | Role | Organisation |
|---|---|---|
| Rachael C Barlow | Clinical Lead Prehabilitation and Enhanced Recovery | Cardiff and Vale University Health Board and Lecturer, Cardiff University |
| Judith Cave | Consultant oncologist | University Hospital Southampton NHS Trust |
| Rob Copeland | Professor of Physical activity and Health | Sheffield Hallam University |
| June Davis (joint lead for the project) | Allied Health Professional Advisor | Policy and Impact, Specialist Advisor Division, Macmillan Cancer Support |
| Oliver Sian Davis | Project manager | Policy and impact, Planning and Deployment, Macmillan Cancer Support |
| Lucy Davidson | Psychologist | London Oncology Clinic, HCA healthcare |
| Diana Greenfield | Macmillan Consultant Nurse | Sheffield Teaching Hospitals NHS Foundation Trust |
| Mike Grocott (Steering group chair and joint lead for the project) | Professor of Anaesthesia and Critical Care Medicine<br>Consultant in Critical Care Medicine | University of Southampton<br>University Hospital Southampton NHS Foundation Trust |
| Richard Harries | Cancer alliance manager | Wessex Cancer Alliance |
| Alison Hill | Lead cancer nurse | University College Hospital NHS Foundation Trust |
| Liam Humphrey | Research Fellow | Sheffield Hallam University |
| Professor Alan Jackson | Professor of Human Nutrition | University of Southampton |
| Jenny Keane | Consultant Allied Health Professional | Public Health Agency, Northern Ireland |
| David MacDonald | Service improvement manager | NHS Scotland |
| Claire Mallett | Programme manager – Living with and beyond cancer | Kent and Medway Cancer Alliance |
| Wendy Makin | Medical Director | The Christie NHS Foundation Trust |
| John Moore | Consultant in Anaesthetics and Intensive Care Medicine<br>Clinical Head of Division for Anaesthesia, Peri-Operative Medicine and Critical Care Services | Central Manchester NHS Foundation Trust |
| Susan Moug | Consultant surgeon | University of Glasgow |
| Richard Simcock | Consultant oncologist | Sussex Cancer Centre, Brighton and Sussex University hospitals NHS Trust |
| Matt Smith | Public Health Consultant, Specialised Commissioning | Public Health England |
| Reta Sowton | Clinical nurse specialist | London Oncology Clinic, HCA healthcare |
| Georgina Wiley | Treatment and Recovery Advisor | Macmillan Cancer Support |
| Fran Williams | Partnership manager | Wessex Cancer Alliance |
| Stephen Wootton (chair) | Associate Professor in Nutrition NIHR Cancer & Nutrition Collaboration | University of Southampton |

## Expert working group members

| Name | Role | Organisation |
|---|---|---|
| **Nutrition working group** | | |
| Neil Bibby | Macmillan Senior Specialist HPB Dietitian | Manchester University NHS Foundation Trust |
| Franco Carli | Professor of Anaesthesia | McGill University, Montreal |
| Jenny Doe | Person with cancer | – |
| Chelsia Gillis | PhD candidate in the Community Health Sciences | University of Calgary |
| Denny Levett | Professor of Perioperative Medicine and Critical Care | University of Southampton |
| Dileep Lobo | Professor of Gastrointestinal Surgery | University of Nottingham |
| Clare Shaw (co-chair) | Consultant Dietitian and Lead for Therapy Research | The Royal Marsden NHS Foundation Trust |
| Kai-Keen Shiu | Consultant Medical Oncologist | University College Hospitals NHS Foundation Trust |
| Paul Wischmeyer | Professor of Anaesthesiology and Surgery | Duke University, North Carolina |
| Stephen Wootton (chair) | Associate Professor in Nutrition NIHR Cancer & Nutrition Collaboration | University of Southampton |
| **Physical activity working group** | | |
| Linda Denehy | Professor of Physiotherapy | Melbourne School of Health Sciences, Australia |
| Sandy Jack (co-chair) | Professor of Prehabilitation Medicine | University of Southampton and University Hospitals Southampton NHS Foundation Trust |
| Lee Jones | Exercise Scientist | Memorial Sloan Kettering Cancer Centre |
| Della Ogunleye | Person with cancer | – |
| Orla McCourt | Research Physiotherapist | University College London, Health Behaviour Research Centre |
| John Moore (chair) | Consultant in Critical Care and Anaesthesia | Manchester Royal Infirmary |
| Daniel Santa Mina | Assistant Professor in Kinesiology | University of Toronto |
| Gerrit Slooter | Surgical Oncologist | Máxima Medical Center, Veldhoven, Netherlands |
| Robert J Thomas | Consultant Oncologist | Primrose Oncology Unit, Bedford Hospital NHS Trust and Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust |

| Name | Role | Organisation |
|---|---|---|
| **Psychology working group** | | |
| Anna Campbell (co-chair) | Professor in Physical Activity and Psychology | Edinburgh Napier University |
| Rob Copeland (chair) | Professor of Physical Activity and Health | Sheffield Hallam University |
| Gerard Danjoux | Consultant Anaesthetist | South Tees Hospitals NHS Foundation Trust |
| Chloe Grimmet | Senior Research Fellow | National Institute for Health Research and Macmillan survivorship research group, University of Southampton |
| Philippa Hyman | Clinical Psychologist | Macmillan Mental Health Clinical Lead, Transforming cancer Services Team, London |
| Clive Moore | Person with cancer | – |
| Anna Roberts | MRC Doctoral Researcher | University College London |
| Derek Rosario | Consultant Urological Surgeon | Royal Hallamshire Hospital, Sheffield |
| Richard Simcock | Consultant Clinical Oncologist | Sussex Cancer Centre, Brighton and Sussex University hospitals NHS Trust |

### Evidence synthesis team

| Name | Role | Organisation |
|---|---|---|
| Ellie Bloom | Strategic analyst | Macmillan Cancer Support |
| Matt Cavill | Senior strategic analyst | Macmillan Cancer Support |
| Wendy Kimber | Strategic Insight Lead | Macmillan Cancer Support |
| Chris Wilson | Library and information specialist | Macmillan Cancer Support |

### Patient group

Several patient groups were accessed across several cancer alliances in England to support and inform this work. Some alliances used existing patient groups and others used short surveys to understand peoples experiences of prehabilitation. We are extremely grateful to all who took part in this element of the work which has helped inform these principles and guidance.

| Stakeholder group | | |
|---|---|---|
| **Name** | **Role** | **Organisation** |
| **Royal College of Anaesthetists representatives** | | |
| Dorian Martinez | Perioperative Medicine Programme Coordinator | Royal College of Anaesthetists |
| James Goodwin | Head of Research | Royal College of Anaesthetists |
| Mike Grocott | Council member and perioperative medicine lead | |
| Janice Fazackerley | Vice President | Royal College of Anaesthetists |
| Ravi Mahajan | President | Royal College of Anaesthetists |
| Sharon Drake | Director, Clinical Quality, Research and Development | Royal College of Anaesthetists |
| **Macmillan cancer rehabilitation steering group** | | |
| Anna Tee | Partnership Manager | Macmillan Cancer Support |
| Dany Bell | Specialist Advisor, Treatment and Recovery | Macmillan Cancer Support |
| Deepa Doshi | Partnership Quality Lead | Macmillan Cancer Support |
| Fiona Taylor | Partnership Manager | Macmillan Cancer Support |
| Helen Petley | Partnership Quality Lead | Macmillan Cancer Support |
| Jacqueline Goodchild | Advisor, Workforce | Macmillan Cancer Support |
| Jo Fairhurst | Learning and Development Manager, Midlands and East | Macmillan Cancer Support |
| Joanne Adamson | Strategic Partnership Manager | Macmillan Cancer Support |
| Paula Kealey | Strategic Partnership Manager | Macmillan Cancer Support |
| Rachael Atkinson | Partnership Quality Lead | Macmillan Cancer Support |
| Ruth Thompson | Partnership Manager | Macmillan Cancer Support |
| Sinead Clarke | Macmillan GP | Macmillan Cancer Support |
| Sheila Small | Partnership Quality Lead | Macmillan Cancer Support |
| Sue Lewis | Partnership Quality Lead | Macmillan Cancer Support |
| **Macmillan senior representation** | | |
| James Austin | Director, Specialist Advisor and Quality and Impact | Macmillan Cancer Support |
| Fran Woodard | Executive Director, Policy and Impact | Macmillan Cancer Support |
| **Macmillan AHP expert advisory group** | | |
| Ann Montagu | Senior Commissioning Manager | NHS North West Surrey Clinical Commissioning Group |
| | Executive Director, Policy and Impact | Macmillan Cancer Support |
| Dr Anna Lowe | AHP cancer implementation manager | NHS England |
| Dr Anne Johnson | Clinical Lead/Consultant Occupational Therapist & Macmillan Professional<br>Bath Centre for Fatigue Services | Royal National Hospital for Rheumatic Diseases |
| Catherine Neck | Macmillan Cancer Rehabilitation/ Living With and Beyond Cancer Lead | Avon & Somerset |
| Debbie Provan | Regional Lead Living With and Beyond Cancer & National Macmillan AHP Lead for Cancer Rehabilitation | West of Scotland Cancer Network |

| Name | Role | Organisation |
|---|---|---|
| Jenny Hunt | Macmillan Principal Lead Speech & Language Therapist, Head & Neck/ ENT | Luton and Dunstable University Hospital NHS Foundation Trust |
| Karen Robb | Macmillan Cancer Rehabilitation Lead | Transforming Cancer Services Team, London |
| Lucy Davis | Macmillan Therapy Lead | Heart of England NHS Foundation Trust |
| Lucy Eldridge | Dietetic Team Leader/Chair of the BDA Oncology Specialist Group | The Royal Marsden NHS Foundation Trust |
| Nikki Hawkins | Macmillan survivorship programme lead | Gloucestershire CCG |
| Wendy Wilkinson | Macmillan AHP lead | Wales Cancer Network |
| Zoe Merchant | Programme manager and specialist occupational therapist | Prehab4cancer, Greater Manchester |
| **Wider Stakeholder group** | | |
| Afni Shah-Hamilton | Podiatrist | Tiptoe Foot Care |
| Alex King | Consultant clinical psychologist | Imperial College Healthcare NHS Trust |
| Alison Dinham | Cancer rehabilitation therapist | Guy's and St. Thomas' NHS Foundation Trust |
| Amelia Chong | Policy and Public Affairs Manager | Anthony Nolan |
| Andrew Shaw | Professor and Clinical Department Head, Anaesthesiology | University of Alberta |
| Annie Coombes | | Guy's and St. Thomas' Hospital NHS Foundation Trust |
| Ashley Green | Head of Health Initiatives and Services | Yorkshire Cancer Research |
| Bana Haddad | GP Clinical Lead Living With and Beyond Cancer | Kent and Medway Cancer Alliance |
| Bernie McGreevy | Macmillan Clinical Specialist Physiotherapist | Antrim Area Hospital, Northern Health and Social Care Trust |
| Christina Sharkey | Macmillan GP | Daybrook Medical Practice |
| Christopher Button | Lead Cancer Nurse | Calderdale & Huddersfield NHS Foundation Trust |
| Claire Moore | Head of Supportive Therapies | Leaders in Oncology Care |
| Dannie Seddon | Paediatric Anaesthetist | Birmingham Children's Hospital NHS Foundation Trust |
| Davina Moses | Clinical psychologist | Royal Brompton and Harefield NHS Foundation Trust |
| Ellen Copson | Associate Professor in Medical Oncology/Honorary Medical Oncology Consultant | University Hospital Southampton NHS FT |
| Erica Sheward | – | Cancer United |
| Esther Hansen | Clinical psychologist | Royal Free London NHS Foundation Trust |
| Gemma Pugh | Lecturer, Sports & Exercise Medicine | Queen Mary University of London |
| Gemma Tham | Physiotherapist | London Surgical Group |
| Geoff Bellingan | Medical Director for Cancer | University College Hospitals NHS Foundation Trust |
| Ione Ashurst | Head of Therapies | The Royal Marsden NHS Foundation Trust |

| Name | Role | Organisation |
|---|---|---|
| Jacqui Hallam | Learning and Development Manager – North England | Macmillan |
| James Hernon | Consultant in General Surgery | Norfolk and Norwich University Hospitals NHS Foundation Trust |
| James Thorneycroft | Policy Officer | Macmillan Cancer Support |
| Jan Sheward | Founder and Trustee | Cancer United |
| Jess Whibley | Physiotherapist | The Royal Marsden NHS Foundation Trust |
| Jo Pain | Macmillan Specialist Community Dietitian | Gloucestershire Care Services NHS Trust |
| Joanne Horton | ABMUHB Macmillan Allied Health Professional Lead | Morriston Hospital |
| Justin Roe | Joint Head – Department of Speech & Language Therapy<br>Honorary Lecturer – Division of Surgery, Department of Surgery and Cancer, Faculty of Medicine | The Royal Marsden NHS Foundation Trust and Imperial College London |
| Kate Harley | Macmillan Senior Review Radiographer | Eastbourne Radiotherapy Unit, Brighton and Sussex University Hospitals NHS Trust |
| Kate Hurst | Macmillan Assistant Psychologist, General Oncology Psychological care team, Cancer Division | University College Hospitals NHS Foundation Trust |
| Katharine Malhotra | Darzi Fellow, Therapy Services | The Royal Marsden NHS Foundation Trust |
| Krishna Moorthy | Consultant surgeon | Imperial College Healthcare NHS Trust |
| Laura Leadsford | Head of AHPs, London Region | Health Education England |
| Laura Miller | Macmillan Project Lead Dietitian | Nottingham University Hospital NHS Trust |
| Lesley Smith | Senior programme manager, Living with and Beyond Cancer | NHS England |
| Liz Price | Associate Director (Living With & Beyond Cancer) | Transforming Cancer Services Team, London |
| Mara Sheldon | Occupational Therapist/Trainer | Positive Energy Partnership Ltd |
| Mark Barrington | Consultant Clinical Psychologist | Barts Health NHS Trust |
| Mary Burgess | Consultant Clinical Psychologist | University College Hospitals NHS Foundation Trust |
| Michael Clinton | Macmillan Recovery Package Manager | Salford Royal NHS Foundation Trust |
| Mike Rennoldson | Consultant Clinical Psychologist & Senior Lecturer in Psychology | Division of Psychology, Nottingham Trent University |
| Mike Stevens | Emeritus Professor of Paediatric Oncology | University of Bristol |
| Natalie Harris | Dietitian | The Royal Marsden NHS Foundation Trust |
| Nicola Hill | Macmillan Prehabilitation Project Manager | Calderdale & Huddersfield NHS Foundation Trust |
| Nicola Peat | Cancer rehabilitation therapist | Guy's and St. Thomas' NHS Foundation Trust |
| Peter Storfer | Patient representative | |
| Pippa Mather | Principal Head & Neck Oncology Dietitian | Guy's and St. Thomas' NHS Foundation Trust |

| Name | Role | Organisation |
|---|---|---|
| Rachel Lee | Macmillan GP Lead | Wales |
| Rachel Lewis | Macmillan Allied Health Professional Lead – Cancer Rehabilitation | Hywel Dda University Health Board |
| Rachel Newton | Head of Policy | Chartered Society of Physiotherapy |
| Raigan Rafferty | | Newcastle Upon Tyne Hospitals NHS Foundation Trust |
| Rebecca Robinson | Sports and exercise medicine consultant | |
| Rhidian Jones | Consultant Anaesthetist | Princess of Wales Hospital, Bridgend |
| Sahil Suleman | Macmillan consultant clinical psychologist | St. George's University Hospitals NHS Foundation Trust |
| Sally Picken | Macmillan senior quality improvement manager | East Midlands Cancer Alliance |
| Samual Dick | Policy Officer | Macmillan Cancer Support |
| Sarah Hanson | Lecturer in Health Sciences | University of East Anglia |
| Siobhan Cowan-Dickie | Clinical Specialist Physiotherapist | The Royal Marsden NHS Foundation Trust |
| Stephanie Bell | Programme Manager | Surrey and Sussex Cancer Alliance |
| Stuart Griffiths | Director of Research and Services | Yorkshire Cancer Research |
| Sue Smith | Consultant clinical psychologist | Guy's and St. Thomas' Hospital NHS Foundation Trust |
| Susan Vyoral | Gastrointestinal and nutrition team | The Royal Marsden NHS Foundation Trust |
| Tarannum Rampal | Consultant Anaesthetist | Medway NHS Foundation Trust |
| Teresa Karran | Macmillan Primary Care Lead | Macmillan Cancer Support |
| Troy Chase | Macmillan clinical psychologist | Imperial College Healthcare NHS Trust |
| Victoria Aubrey | Dietitian | The Royal Marsden NHS Foundation Trust |
| Dr William Ricketts | Consultant Chest Physician | Barts Thorax Centre, Barts Health NHS Trust |
| Zoe Merchant | Programme manager and specialist occupational therapist | Prehab4cancer, Greater Manchester |

## Appendix 2: Research questions

**Physical activity and exercise**

- What outcome measures should be used to determine impact of prehabilitative exercise programme in people with a cancer diagnosis?
- What is the minimum and maximal effective dose of personalised SEP prior to surgery?
- What is the minimum and maximal effective dose of personalised SEP prior to chemo and/or radiotherapy?
- What is the role of digital technology in supporting exercise programme in prehabilitation?
- Variation in response.
- Putative mechanism(s)
- Tumour regression
- Home-based/Community/in-hospital

**Issues around identifying nutritional risk**

- How can we routinely incorporate preoperative nutritional evaluation into a prehabilitation program to identify risk, response to treatment and/or identify patients who would benefit from nutritional care?
- Are all screening tools equally sensitive and specific in all cancer sites (eg weight losing cachectic vs high Body Mass Index cancers) what are the limits to their use in the prehabilitation setting?
- What is the best approach to assessing lean or muscle mass in clinical practice in accordance with Global Leadership Initiative on Malnutrition diagnosis of malnutrition – Computerised Tomography (CT), ultrasound or bio-electrical impedance analysis? What criteria or cutoffs?
- What is the value of including other biomarkers of risk such as albumin, C Reactive Protein, modified Glasgow Prognostic Score?

**Issues around type of nutritional intervention**

- What are the key goals of pre-operative nutritional care – repair damaged metabolic machinery (address reductive adaptation), reduction of inflammation, or improvement of markers of malnutrition, increase energy and nutrient intake, weight gain, increase lean/muscle mass or maximise adherence/response to training?
- What are the most nutritionally sensitive and specific outcome measures?
- What is the most effective means of delivering nutritional counselling – face to face or remotely via web/app-based coaching?
- When should dietary counselling, oral nutritional supplements (ONS), high protein oral nutrition supplements (hp-ONS), enteral nutrition (EN), and parenteral nutrition (PN) be initiated in prehabilitation?
- What is the role of achieving protein delivery goals in prehabilitation nutrition? Are there demonstrable benefits of hpONS over standard ONS (isonitrogenous and isocaloric) in prehabilitation setting?
- What is the role of immunonutrition in optimising patient outcomes? Are there demonstrable benefits of immunonutrition ONS over standard ONS (isonitrogenous and isocaloric) or hpONS?
- What is the role of maximising micronutrient intake in improving patient outcomes – should we be using repletion dose levels of micronutrients by mouth or intravenously?
- How do nutritional interventions influence the adherence/response to other therapies and how other therapies influence nutritional requirements?

**Psychological interventions and behaviour change**

- What outcome measures should be used to determine impact of prehabilitative psychological support (eg self-efficacy, control/autonomy/quality of life/wellbeing) in people with a cancer diagnosis?
- What is the stratification for referral to and from more or less specialist/clinical psychological support during prehabilitation in people with a cancer diagnosis?
- What metrics should be adopted at baseline to screen for psychosocial risk factors in people with a cancer diagnosis (NB: triage tool, not just research tool)?
- What are the active ingredients of psychological/behaviour change support (eg what are the commonly applied behaviour change techniques)?
- What is the role of technology in supporting behaviour change in people with a cancer diagnosis during the prehabilitation pathway
- What psychological variables effect engagement in and adherence to prescribed prehabilitation treatment in people with a cancer diagnosis?
- What theoretical models/frameworks (including behaviour change techniques) commonly underpin prehabilitative psychological interventions to support people with a cancer diagnosis to change their behaviour?
- How can psychological/behaviour change support for people with a cancer diagnosis be embedded into existing resources across the system rather than creating ‘new’ or ‘bespoke’ services that are unsustainable?
- To what extent can the outcomes of people with a cancer diagnosis post treatment be enhance by the co-design of prehabilitation interventions pre-treatment?

We’re here to help everyone with cancer live life as fully as they can, providing physical, financial and emotional support. So whatever cancer throws your way, we’re right there with you.

**Macmillan.org.uk**

Printed using sustainable material. Please recycle. Macmillan Cancer Support, registered charity in England and Wales (261017), Scotland (SC039907) and the Isle of Man (604). Also operating in Northern Ireland.