

Psychological support and behaviour change interventions during the perioperative period for people with a cancer diagnosis; Consensus statements for use from Macmillan, The Royal College of Anaesthetists and the National Institute for Health Research.

Authors

Copeland, R.J^{1,2}., Campbell, A³., Danjou G⁴., Grimmett, C⁵., Hyman, P⁶., Humphreys, L.J¹., Roberts, A⁷., Rosario, D.J⁸., and Simcock, R⁹.

1. The Advanced Wellbeing Research, College of Health, Wellbeing and Life Sciences, Sheffield Hallam University, Sheffield, UK.
2. The National Centre for Sport and Exercise Medicine
3. School of Applied Sciences, Edinburgh Napier University
4. South Tees Hospitals NHS Foundation Trust
5. School of Health Sciences, University of Southampton, Southampton, UK
6. Transforming Cancer Services Team for London
7. Department of Behavioural Science & Health, University College London, London, UK
8. Department of Oncology and Metabolism, University of Sheffield, Sheffield, UK
9. Brighton and Sussex University Hospitals NHS Trust

Introduction

There is an emerging evidence base for the value of physical and psychosocial interventions for people with cancer around the time of diagnosis and first treatment[1]. Often termed “prehabilitation,” this period refers to a process on the cancer continuum of care that occurs between the time of cancer diagnosis and the beginning of acute treatment¹[2]. Prehabilitation includes physical and psychological assessments that establish a baseline function level, identify impairments, and provide interventions that promote physical and psychological health to reduce the incidence and/or severity of future impairments[2].

More broadly, prehabilitation provides a unique opportunity to promote the importance of healthy behaviours in the long-term treatment and recovery from cancer. Recent systematic reviews have identified that prehabilitation has the potential to provide several benefits for patients including improvement in psychosocial outcomes such as mood, distress, depression and optimism[3]. A cancer diagnosis may be a specific cause of anxiety[4] and preparation for treatment (e.g. major surgery) might induce additional anxiety[5]. There is mounting evidence that pre-treatment psychological factors impact physiological and psychological post-treatment outcomes[6]. For example, preoperative anxiety[7] depression [8] and distress[9] have been consistently associated with increased postoperative pain and wound healing[10]. High anxiety preoperatively can also lead to increased length of hospital stay, increased analgesic requirements and prolonged recovery time[11]. Observational evidence suggests preoperative depression and self-efficacy (i.e. confidence in one’s capability to manage disease-related factors) predicts longer-term recovery of health-related quality of life in cancer patients [12]. Preparing the patient psychologically for treatment can enhance feelings of control, reduce anxiety and increase patient satisfaction post-treatment as well as facilitating early discharge[6], [13]. As such, there has been increasing research interest examining the efficacy of perioperative interventions on psychological outcomes in people affected by cancer. Multimodal prehabilitation programmes frequently include psychological support, as well as interventions that target several other health behaviours (e.g. physical activity and exercise, nutrition, smoking and alcohol consumption)[14]. The success of prehabilitation programmes depends on changing several aspects of patients’ behaviour, including attendance at, engagement with and adherence to the behavioural (e.g. exercise, nutrition) and psychological components of prehabilitation. As a result, the role of psychology in prehabilitation is not limited to promotion of psychological wellbeing, but also in the design and implementation of each component of a prehabilitation programme to promote and sustain behaviour change.

¹ In this context we recognise that both chemotherapy and radiotherapy might be the first definitive treatment offered to a cancer patient however the majority of published data focuses on surgery – the term ‘perioperative’ is therefore used in this document to identify a time period for prehabilitation interventions.

The development of a consensus on the use of psychological interventions in people living with and beyond cancer

During 2017 Macmillan Cancer Support developed a strategic evidence and insight report[15] on prehabilitation in oncology, in collaboration with internal and external stakeholders. After discussion of the research findings with clinical and academic teams, it was agreed that service users, commissioners and service providers could benefit from the development of principles and guidance for prehabilitation in oncology for use UK wide. This guidance would be developed across three core components of i) physical activity and exercise, ii) nutrition, and iii) psychological support and behaviour change. Macmillan Cancer Support, the National Institute for Health Research (NIHR) and the Royal College of Anaesthetists (RCOA) formed a partnership to undertake this work using the banner 'Fit for cancer treatment' (FACT). The programme aimed to bring benefit to patients by; influencing national, regional and local policy in relation to the delivery of care for those with cancer; influencing the provision of care for those with cancer through the guidance of care providers; and educating patients, clinicians, academic colleagues, providers and policymakers. The guidance is intended to be applicable to any tumour type.

Method

The Macmillan evidence and insight team performed a comprehensive review of the extant literature. The protocol and output from this process are reported elsewhere (https://www.macmillan.org.uk/_images/prehabilitation-comprehensive-evidence-review_tcm9-354105.xlsx). Briefly here, a comprehensive database search of publications detailing interventions delivered before and during the treatment of adult cancer patients over the past 25 years was undertaken using MEDLINE (PubMed), EMBASE, CINAHL, PsycINFO and AMED. The literature search was informed by a series of research questions, developed via workshop of the Chair and Co-chairs of each Expert Working Group. The research question of interest for this manuscript was: What are the clinical and cost-effective (health economic) benefits of psychological wellbeing/behaviour change intervention/prehabilitation prior/during cancer treatments?

Studies were selected with an emphasis on meta-analyses and randomized controlled trials, but also included systematic reviews, and non-randomised trials given the anticipated infancy of the evidence. Through a modified Delphi process, studies were reviewed and graded according to the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system[16]. The modified Delphi process (conference) took place in February 2019 over two days, hosted in London at the Royal College of Anaesthetists. An international group of topic experts attended and worked collaboratively within topic groups to develop the principles and guidance. Each group catalogued

and reviewed the literature in their respective area, classifying the quality of evidence and developing consensus statements according to GRADE methodology[16]. The consensus statements are therefore based on the best current evidence and represent the joint efforts of the FACT group.

This approach is consistent with previous guideline development[13]. The conference concluded with an agreed set of Consensus statements, Practice Recommendations and Research questions from each of the three topic groups. The following manuscript outlines those consensus statements, for the psychological support and behaviour change group. Each consensus statement is supported by a commentary, which provides contextual evidence underpinning the statement. The aim is to provide guidance on the use of psychological interventions (including behaviour change techniques that apply across all aspects of a multimodal prehabilitation programme) in people living with and beyond cancer for those working in/researching the perioperative period of care for patients with a cancer diagnosis.

The manuscript is split into two sections. In recognition of the potential psychological distress that may arise from a cancer diagnosis and associated treatment, section 1 presents consensus statements for the provision of psychological support for psychosocial risk factors (e.g. anxiety, depression) within prehabilitation. The second section presents consensus statements for the promotion of behaviour change and is therefore intended to be applied across each component of a prehabilitation programme (exercise, nutrition and psychological wellbeing). These statements are also intended to help inform the design of prehabilitation interventions, and interventions that can promote sustained healthy behaviours in people with a cancer diagnosis, so to improve long-term quality of life, mitigate side-effects of treatment (e.g. fatigue) and potentially reduce future cancer risk.

Section 1: Psychological Support

The impact of preoperative psychological risk factors on outcomes post-surgery

Most current studies exploring possible associations between preoperative psychological risk factors on outcomes post-surgery demonstrate significant heterogeneity; nonetheless, some consistent themes emerge as to the influence of preoperative psychological status on short and longer-term perioperative outcomes. For example, higher self-efficacy, a low preoperative pain expectation and general optimistic outlook all correlate with a lower risk of adverse surgical outcome[6]. On the other hand, the same review[6] identified depression, state anger and general psychological distress as having a negative impact on outcome following surgery. Preoperative anxiety is recurrently identified as a risk factor for adversely affecting the shorter-term perioperative outcomes of postoperative pain and hospital length of hospital stay[6], [17]. Acute perioperative complications might also have a negative impact on longer-term health and wellbeing [18]. The risk of developing chronic post-surgical pain appears to be increased by preoperative depression, psychological vulnerability and chronic stress [8]. Pre-surgical depression and low self-esteem also appear to be correlated with slower recovery and lower self-reported quality of life in patients up to 2 years following surgery for a colorectal cancer diagnosis [12]. Encouragingly, many of these likely risk factors for poor outcomes seem to be amenable to preoperative psychological intervention to mitigate that risk [19]. Data extracted from studies in this review, however, revealed significant heterogeneity, and therefore the underlying mechanisms for associations between intervention and positive outcomes are not known. Increased research attention on the impact of preoperative psychological risk factors on outcomes post-surgery will be pivotal in prehabilitation initiatives to support patients identified as being at risk.

The influence of preoperative psychological patient factors on perioperative outcomes including complications, pain and hospital length of stay are difficult to quantify. Where risk factors are identified that adversely influence perioperative outcomes, it is critical to determine whether they are modifiable by a preoperative intervention. Conversely, apparently beneficial psychosocial states require study to identify positive components.

Summary and consensus statement

- Psychosocial risk factors are associated with outcomes after surgery including pain and length of hospital stay.
- GRADE C – WEAK

Screening for psychosocial risk factors as part of a person-centred approach to cancer treatment

Cancer and its treatment represent a significant event that can impact the physical, mental and socio-economic wellbeing of both the patient and their social network[20]. A cancer diagnosis commonly elicits non-pathological feelings of vulnerability, sadness, and fear [4], but for some, a cancer diagnosis can lead to profound psychological difficulties that can continue throughout treatment to living with and beyond cancer[21]. The assessment of psychological morbidity is particularly complex around diagnosis since it involves untangling an immediate response to diagnosis, which may resolve, from other factors that require intervention. Disabling psychological difficulties can take multiple forms but typically include depression and anxiety[22]. Approximately 30-40% of patients receiving cancer care will experience some form of psychological difficulty that is outside accepted norms[23]although the type, nature and strength vary dependant on patient demographics, cancer stage and type[24], [25]. Patients with pre-existing psychiatric disorders are at even greater risk[26]. Psychological difficulty can negatively impact adherence to treatment[27], patient quality of life and even survival [28]. Furthermore, psychological difficulty at diagnosis or soon after (i.e. within 3 months) has shown to be predictive of longer-term distress after cancer[29], with further quality of life impact and increased health care costs[29]. Importantly, and as described above, symptoms of psychological difficulty in people with a cancer diagnosis are amenable to change via intervention[26], including during the perioperative period[30].

Identifying patients most in need of support is imperative, however, the implementation of routine psychosocial screening and referral in cancer is complex, as highlighted in a recent review [26]. Furthermore, the evidence in support of systemic screening and treatment of psychological difficulties in patients with cancer is equivocal[23]. Whilst McCarter and colleagues (2018) [24]suggest that there is considerable scope to improve the implementation of screening and referral to support for psychosocial difficulty in cancer settings, Shimizu (2013) [31]highlights contradictory results and lack of clear effectiveness from such effort. A recent randomised controlled trial (RCT) reported that screening and subsequent treatment did not improve psychological distress, although enhanced discussion of psychosocial concerns had some positive impact on well-being [32].

The shortfalls in the screening evidence base could perhaps be explained by the heterogeneous range of psychological interventions of varying quality and content[19], [31], [33]and access to appropriate aftercare [34] for example depression screening is only effective if subsequent, adequate treatment is offered[23]. There are also significant clinician level (lack of time, training,

and confidence) and organisational level barriers (lack of resources, no screening strategy) [34]. The barriers are so great that the proportion of those receiving psychosocial care after a positive screen was only one in three[34]. Authors have also suggested that screening needs to be followed-up with additional assessments, contacts and monitoring of the treatment process by adequately trained staff [23], a challenge within current resources. This perhaps highlights the need for whole system interventions, including system prompts such as the cancer Quality of Life Metric[35], to improve patient psychological outcomes across the cancer pathway. In the UK, some NHS Trusts' psycho-oncology team's work with a full range and severity of psychological and mental health difficulties associated with cancer. These teams are well located but not always well resourced to support the psychosocial needs of patients and improve patient experience and outcomes. These teams offer highly specialist clinical care for inpatients and outpatients, as well as input for families and carers. The majority of psycho-oncology services provided by these teams are underpinned by NICE guidance[36], especially the use of the four levels of psychological assessment and support. NICE guidance provides recommendations specific to patient and carer involvement, how to arrange psychological services, as well as palliative care, rehabilitation services, services for families, carers, and workforce development. Although more than 14 years since publication, these NICE recommendations are not being met in relation to psychological support [20]. There is a need to underline the importance of ensuring that people with a cancer diagnosis are screened for psychosocial risk factors and directed to appropriate support in accordance with these NICE recommendations[36].

Summary and consensus statement

- People with a cancer diagnosis need to be screened for psychosocial risk factors as part of a person-centred assessment as close to diagnosis as possible and routinely throughout their treatment. The outcome should direct appropriate support in accordance with NICE recommendations[36].
- GRADE B – STRONG

Pre-operative psychological interventions and psychosocial outcomes

Existing psychological prehabilitation studies in oncology tend to target the most commonly reported psychological challenges of heightened anxiety, distress or depression around the time of diagnosis. They typically use relaxation techniques, stress management, guided imagery and psychotherapeutic interventions. In a review of psychological prehabilitation studies prior to cancer

surgery, Tsimopoulou et al [33] identified seven studies, including six RCTs. Three of the four trials that assessed depression/mood disturbances found a reduction in symptoms immediately prior to treatment and/or post-operatively, with one trial examining anxiety and reporting favourable effects in the intervention group. Evidence has also emerged from trials of multimodal prehabilitation that include a psychological component. In a pilot, pre-post trimodal intervention including exercise and protein supplementation, 42 colorectal cancer patients received a 90-minute consultation with a psychologist, who provided anxiety reduction techniques including relaxation and breathing exercises. Statistically significant reductions in anxiety and depression (as measured by the Hospital Anxiety and Depression Scales [HADS]) were reported immediately before surgery, as well as four, and eight weeks postoperatively[30]. Using similar methodology, Gillis et al [37] conducted a small RCT comparing prehabilitation and rehabilitation with the same multimodal intervention delivered to both groups either four weeks before surgery or immediately after, continuing for a further eight weeks. The psychological intervention was comparable to that employed by Li et al (2013) [30] with a 60-minute one-to-one session delivered by a psychologist focusing on relaxation techniques. There were no differences in HADS scores between groups at any of the follow-up points.

Though not explicitly defined as psychological interventions, preoperative education programmes are increasingly being offered within perioperative pathways in various clinical groups, including cancer cohorts. These programmes are multifaceted but commonly include information provision on pain, medication and expectations for the post-operative period, and often endeavour to reduce anxiety. Evaluation of these programmes has tended to focus on surgical outcomes; however, some have included measures of psychosocial constructs. For example, Waller et al [11] identified 14 trials in a review of presurgical education studies. The education sessions were delivered in a variety of formats, including written and audio-visual, however face-to-face programmes were most favourably received with five out of seven reporting a positive impact on anxiety. Ibrahim et al [38] describe the implementation of a multidisciplinary preoperative group-based teaching session for women waiting for breast cancer surgery. The pre-post assessment suggests a reduction in anxiety, although it was assessed with a single, unvalidated item.

Evidence of the efficacy of psychological intervention in the preoperative period in cancer populations is in its infancy, though shows promise for favourable impact on psychosocial outcomes, particularly anxiety and depression. There is however, considerable heterogeneity in the data, likely a result of variability in intervention components and modality, small sample sizes, variation in outcome measures and timing of assessment. Furthermore, few studies report eligibility criteria - based on a preliminary assessment of psychosocial factors to determine the need for psychological intervention. As per the recommendation above, characterising patients close to the point of

diagnosis would enable personalised and targeted intervention, which is likely to result in greatest impact on patient outcomes.

Summary and consensus statement

- Pre-operative psychological interventions improve anxiety, depression and self-efficacy to engage in treatment in the short term, in people with a cancer diagnosis
- GRADE C – WEAK

Prehabilitation support for people with a cancer diagnosis and pre-existing serious mental illness

Patients with a pre-existing serious mental illness are a group with specific comorbidity that requires a careful and multidisciplinary approach to achieve best and equitable outcomes. In this context 'Serious Mental Illness' adopts the definitions used by NICE Quality and Outcomes Framework[39] and includes severe depression and psychosis. There are relevant concerns around delays in diagnosis and late presentation for this group, but nonetheless, people with serious mental illness report worse cancer outcomes even when matched for stage[40], [41]. Schizophrenia has been demonstrated to cause significant problems in the care of patients with breast cancer[42] and serious mental illness has been associated with less active treatment in patients with colon cancer [43]. Associations with increased cancer mortality are seen most strongly with psychotic disorders but are also observed in severe depression[44]. Issues contributing to poor outcomes in people with serious mental illness include; refusal of treatment, inability to adhere to treatment protocols; and inequitable treatment allocations due to intrinsic bias amongst healthcare providers[45]. Cancer treatments might worsen mental health or precipitate crisis, for example, iatrogenic psychosis seen with high dose steroids or relapsed depression after a cancer diagnosis. There is also evidence that cancer teams could fail to adequately recognise serious mental illness in patients [46]. It is therefore, necessary for cancer multidisciplinary teams to work closely with mental health professionals to provide best care for patients and to ensure the prescription of optimal psychiatric therapies in advance of cancer therapy. Advice from pharmacologists to ensure that metabolism of anti-psychotics or anti-depressants is not adversely affected by co-prescription of chemotherapies or delayed by surgery is recommended. Mental health key workers represent a source of expertise and support for patients and therefore have a key role to play in the treatment pathway. Where necessary, they are requested to support the patient in pre-treatment advocacy and decision-making. Although no clinical trials were identified as part of the evidence review, a large amount of evidence was available to demonstrate differential outcomes and a recent feasibility pilot has paved

the way for future randomised trials[47]. Optimising mental health, therefore, needs to be viewed as a priority in prehabilitation of this patient group.

Summary and consensus statement

- Patients with a cancer diagnosis and a premorbid diagnosis of serious mental illness, including clinical depression and psychosis require closer monitoring, liaison and support.
- GRADE B - STRONG

Section 2: The promotion of behavioural change across all aspects of multimodal prehabilitation programmes

Supporting people with a cancer diagnosis to engage and adhere with prescribed prehabilitation programmes

Successful prehabilitation depends 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) [48]. BCTs are “an observable, replicable and irreducible component of an intervention designed to alter or redirect causal processes that regulate behaviour; that is a technique is proposed to be an ‘active ingredient’ (e.g. feedback, self-monitoring and reinforcement)” [48]. Of the studies included in the current evidence synthesis, the most commonly reported (and often only) behaviour change technique used involved education/information provision. Across these studies, little detail was provided about the content of the educational intervention (e.g. “education and information sessions...included addressing the diet, smoking, lifestyle change...” [49]). A minority of studies included additional approaches to support behaviour change including the provision of activity monitors[50], goal-setting[51], motivational interviewing[52] self-monitoring [53]and behaviour change consultations led by nurses[54]. The nurses in this study outlined the benefits and examples of physical activity and encouraged participants to increase physical activity, but no further detail of the actual content of the consultations or how participants were encouraged is provided [54]. There was some evidence of other strategies used to change behaviour or promote adherence within the exercise/nutrition components of prehabilitation, however they were often poorly described making identification of specific BCTs impossible. Multiple strategies are available to promote behaviour change; however, from our review it appears that the majority of the existing prehabilitation literature focuses solely on education and information provision about why exercise and nutrition are important in prehabilitation for cancer treatment. Education, information and knowledge alone is often insufficient for behaviour change [55]. The inconsistent and vague reporting of other aspects of behavioural support in the existing prehabilitation literature prevents any conclusions with regards to effectiveness of other approaches being drawn and this needs to be addressed in future studies. The BCT taxonomy developed by Michie and colleagues provides standardised labels, definitions and examples of 93 BCTs to provide a reliable and systematic approach to specifying and reporting behaviour change interventions and their ‘active ingredients’ [48], [56]. The consistent reporting of behaviour change interventions using a shared language is vital to understand which BCTs are

associated with effectiveness, and for the replication of successful interventions. None of the studies included in the evidence synthesis reported the exercise, nutrition or psychological components of prehabilitation interventions according to a BCT taxonomy and it was beyond the scope of this project for members of the expert group to code each of the included studies according to a taxonomy. As a result, it was not possible to assess which strategies intended to facilitate behaviour change were used most frequently or associated with success. The prehabilitation literature would benefit from study authors reporting intervention content coded to the 'Coventry, Aberdeen & London – Refined (CALO-RE) taxonomy, specifically for physical activity and dietary behaviours (40 BCTs)[57] or the BCT taxonomy v1 [48] within study manuscripts or supplementary files. The benefit of this has been demonstrated in both cancer rehabilitation and wider behaviour change literature. A recent Cochrane review of exercise interventions in people living with and beyond cancer conducted by Turner and colleagues [58] coded included studies according to the CALO-RE BCT taxonomy [57]. This demonstrated that BCTs such as “setting of graded tasks”, “programme set goal” and “instruction of how to perform behaviour” were most commonly included in interventions where previously inactive cancer survivors met Rock et al’s (2012) [59] guidelines for aerobic and resistance exercise after the intervention [58]. Furthermore, a systematic review and meta-regression of physical activity and healthy eating interventions in overweight and obese adults found that the increasing number of BCTs included in an intervention and using the “goal-setting of outcome”, “feedback on outcome of behaviour”, “graded tasks”, “adding objects to the environment” (e.g. step counter) BCTs significantly predicted intervention effectiveness in the long-term [60]. Additionally, a recent systematic review and meta-analysis found that BCTs of ‘action planning, ‘graded tasks’ and ‘social support (unspecified)’ were associated with longer-term physical activity behaviour change in cancer populations[61]. We therefore recommend that future prehabilitation studies report intervention content according to a recognised taxonomy[48], [57]. This is so future evidence syntheses can begin to assess which approaches to behavioural support improve uptake and effectiveness of prehabilitation.

Summary and consensus statement

- People with a cancer diagnosis should be supported to engage and adhere with prescribed prehabilitation programmes with defined & established behaviour change techniques.
- GRADE B – WEAK

Enhancing the design of programmes to support behaviour change in patients during prehabilitation

The UK Medical Research Council guidance recommends that complex evaluations are developed systematically, based on appropriate theory and available evidence, to understand what changes are intended and how change is likely to be achieved as a result of an intervention[62]. Further, NICE guidance states that behaviour change interventions should be explicit about the underlying theory of change [63] and include an explanation of how the intervention works (mechanisms of action), for example by targeting an individual's capability, opportunity and motivation to change behaviour[64]. Understanding an intervention's mechanisms of action is crucial to learn why a particular intervention may or may not have been successful, and to ensure that successful interventions can be replicated. Only two studies identified in the evidence synthesis mentioned a theoretical framework used in the development of their interventions[65], [66]. Nguyen and colleagues[65] stated that their intervention was informed by the Revised Symptom Management Conceptual Model and the Individual and Family Self-Management Theory. The rehabilitation guide for the post-operative element of an exercise intervention developed by Sommer and colleagues [66] was based on the World Health Organisation on International Classification of Functioning[67], self-efficacy theory [68], and motivational interviewing [69]. However, no further information was provided as to how these theoretical frameworks were used to develop or tailor intervention content and no measures of theoretically-relevant constructs (e.g. self-efficacy/confidence) were reported at baseline or follow-up in either study[66]. Furthermore, the wider cancer rehabilitation literature provides little evidence of theoretical underpinning of behaviour change interventions. In a recently updated Cochrane review of 23 studies (40 publications) that assessed the effect of exercise interventions in inactive people affected by cancer, only six were explicitly based on a theoretical model [58]. As mentioned previously, Turner and colleagues highlight that many of the studies included in this review paid little attention to the wider psychological aspects of behaviour change and simply told participants about how to exercise and provided opportunities for them to do so[58].

Indeed, the lack of consideration for the science of behaviour change and common misconceptions about health behaviour change (e.g. that health behaviour change is common sense; that knowledge, information and education drive behaviour; and that individual behaviour can be accurately predicted) may prevent effective policymaking and behaviour change interventions [70]. Therefore, it is important to consider the wider influences on behaviour (beyond education) and determine how our current understanding of behavioural science can be applied to develop effective prehabilitation programmes, where the success of these programmes depend on whether

participants attend/adhere to exercise training, nutritional and psychological interventions. The COM-B (Capability Opportunity Motivation – Behaviour) model of behaviour (Figure 1) and the associated Behaviour Change Wheel framework (Figure 2), incorporate behaviour change theory to provide a systematic approach to the development of behaviour change interventions to target known influences on behaviour. Both frameworks were developed by Michie and colleagues, from 19 pre-existing frameworks of behaviour change identified in a systematic review[56], [71]. Michie and colleagues state that “changing the incidence of any behaviour of an individual, group or population involves changing one or more of the following: capability, opportunity, and motivation relating either to the behaviour itself or behaviours that compete with or support it” (p.60) [56]. The COM-B (Capability Opportunity Motivation – Behaviour) model (Figure 1) [56], [71], can be used to illustrate the influence of these three constructs on behaviour.

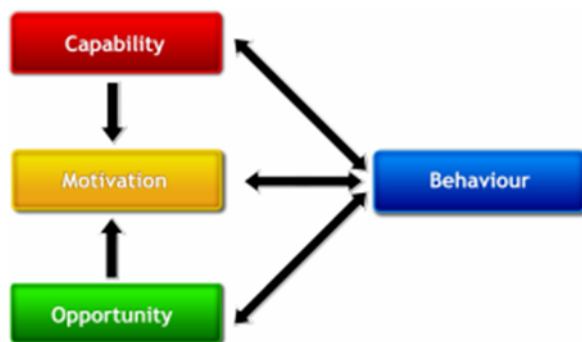


Figure 1: The COM-B system - a framework for understanding behaviour (reproduced with permission from the authors)

Each of these three constructs can be further divided into two (see Figure 2): psychological and physical capability, social and physical opportunity and automatic and reflective motivation [56], [71]. Psychological capability relates to having the knowledge, understanding or psychological skills, strength or stamina (e.g. confidence) to perform the particular behaviour(s) and physical capability relates to having the necessary physical skills, strength or stamina. Social opportunity includes interpersonal influences (e.g. family, friends, healthcare professionals), social cues and cultural norms whereas physical opportunity includes environmental influences on behaviour such as time, physical cues, resources, location or physical barriers. Reflective motivation includes self-conscious planning and evaluations (e.g. intentions, goals, beliefs about capability/consequences of behaviour) whereas automatic motivation relates to processes such as emotional reactions, desires, impulses, inhibitions, drive states and reflex responses[56], [71]. The COM-B model sits at the centre of the Behaviour Change Wheel (BCW) (Figure 2)[56]. The outer levels of the BCW comprise intervention functions and policy categories, which, after identifying the aspects of COM-B that need to change in order for a target behaviour to occur, can be used to understand the types of intervention that are

likely to be most effective and the policies that can support intervention delivery. In the context of prehabilitation, it is crucial to understand how each of these constructs influences the targeted behaviour(s) (e.g. exercise and nutrition) and to develop interventions that incorporate behaviour change techniques that address each of these constructs of behaviour. Where possible, prehabilitation interventions should be tailored to meet individual participants' needs by assessing and addressing each person's capability, opportunity and motivation to change the targeted behaviour(s)[64].

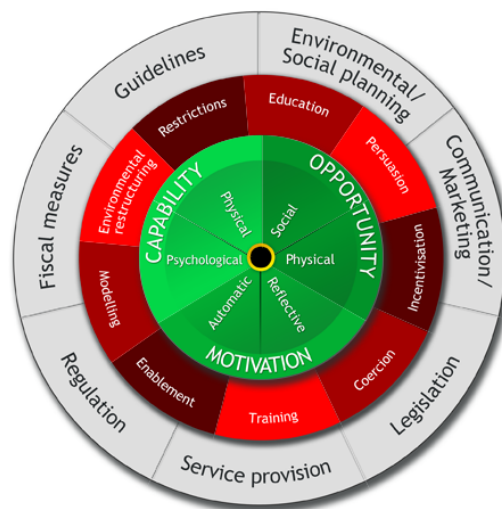


Figure 2: The Behaviour Change Wheel (reproduced with permission from the authors)

Summary and consensus statement

- All prehabilitation interventions should be underpinned by behaviour change theory and an understanding of each patient's capability, opportunity and motivation
- GRADE B – WEAK

Supporting people with a cancer diagnosis into long-term positive health behaviours through a pathway of prehabilitation and rehabilitation

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[72]. Positive lifestyle practices have been associated with numerous benefits during and after cancer treatment with convincing evidence that engaging in physical activity can reduce cancer-related fatigue[73] and improve physical function and quality of life [74]. This is reflected in

numerous consensus statements regarding lifestyle recommendations for people affected by cancer [59], [75], [76]. Yet data suggests that a diagnosis of cancer does not result in spontaneous behaviour change. Williams and colleagues tracked cancer patients smoking, alcohol and physical activity behaviours at three-time points from diagnosis up to 4 years post-diagnosis and compared them to a matched comparison group without a cancer diagnosis[77]. There were no differences between groups in smoking or alcohol consumption, and those with a cancer diagnosis were less likely to be physically active and more likely to be sedentary. Therefore, it is clear that people affected by cancer require support to engage in behaviour change. Indeed, a report from the Independent Cancer Task Force recommended that all patients should receive advice to improve lifestyle behaviours[78]. Evidence also suggests that patients want this information from their healthcare team. In a UK study, people affected by cancer thought that advice on lifestyle factors including diet, physical activity and weight, would be 'beneficial, 'helpful', and 'encouraging' and most thought it was 'the doctor's duty' to provide it[79]. Very few participants thought it would be 'insensitive' or 'implied blame'. Prehabilitation provides a unique opportunity to promote the importance of healthy behaviours in the treatment and recovery from cancer. When Health and Care professionals start conversations about the role of lifestyle practices in the context of treatment plans it gives credibility to their importance. Furthermore, evidence from qualitative evaluations of exercise prehabilitation suggests patients feel a sense of purpose, empowerment and control by taking ownership of an aspect of their treatment [80]. This impetus can then encourage longer-term behaviour change during and after treatment completion. In our evidence review, no published prehabilitation study examined long-term change in behaviour, such as continued exercise participation after study completion. As a first step to supporting behaviour change, all Health and Care professionals are encouraged to deliver very brief advice (VBA) and engage with existing policies (such as Making Every Contact Count[81]) to have conversations with patients regarding the importance of sustained healthy lifestyle behaviours. This may require training and upskilling regarding 'how' to initiate and conduct these types of brief interventions to ensure a consistent approach.

For a patient to make lasting changes to their lifestyle, they need information but also the physical and psychological skills (capability), opportunity and motivation to do so. NICE guidelines [PH49] set out a series of recommendations on how to support long-term behaviour change[64]. As with all perioperative interventions, the intensity of support required will vary and this person-centred approach is core to the NICE guidelines. This requires all professionals supporting behaviour change to work collaboratively with the patient. Conversations need to take into account a person's needs, their social, cultural and economic context, motivation and skills. It is also essential that services

address health inequalities in terms of access to both prehab interventions and behaviour change support. Interventions require the identification of potential barriers to initiating and maintaining behavioural change across different communities of patients. It is recommended that the patient's need for behaviour change support to engage with prehabilitation and broader healthy lifestyle behaviours is assessed close to the point of diagnosis, and an appropriate level of support offered, as per NICE guidelines.

Summary and consensus statement

- During prehabilitation, people with a cancer diagnosis should be supported to identify and develop skills to enable long-term behavioural change
- GRADE C – WEAK

Supporting the workforce to deliver behaviour change in patients during prehabilitation

In the evidence synthesis, no information was reported on the quality or quantity of the training delivered to behaviour change providers/those delivering prehabilitation. As a result, it is not yet possible to define what training is specifically required to assist the providers to facilitate behaviour change support in the prehabilitation setting. That said, the NICE guidelines on how to support behaviour change [PH49][64] recommend that formal training in behaviour change knowledge, skills and delivery techniques should be provided to all who deliver health and social care services. It also recommends that when commissioning providers to deliver this training, it is important to ensure that the course content is evidence-based, delivered by trainers with proven skills, knowledge and experience and that the use of relevant behaviour change competency frameworks is embedded. Training programmes should also consider where and how the intervention will be delivered (clinic, community, group or individual); the professional's background (e.g. nurse, social worker, counsellor) and whether behaviour change is the professional's integral role or an additional task. Finally, NICE PH49 [64] recommends that training should include regular refresher sessions and in particular, opportunities to further role-play difficult scenarios that professionals are likely to experience in practice, so to improve their skills and maintain the quality of the behaviour change intervention. At a minimum, it is recommended that all health and care professionals receive training to deliver a brief intervention to motivate people to make a lifestyle change. For example, Making Every Contact Count (MECC) is a behaviour change approach that uses the brief day-to-day interactions that health and care professionals have with patients to encourage changes in behaviour that have a positive effect on the health and wellbeing of the patient. There are evidence-based training resources on how to MECC[81] available through NHS Health Education England website: <https://www.makingeverycontactcount.co.uk/training/e-learning/other-e->

[learning-resources/](#), which can be used to support behaviour change at each patient interaction. The NICE Public Health Guidelines Behaviour Change: General Approaches [PH6] [63] suggest that reminder systems such as 'Ask, Advise, Act' are among the more effective methods for changing behaviour. Delivery of VBA should take only 30 seconds to 2 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[82], however the evidence of the effectiveness of VBA on other lifestyle factors such as diet and physical activity is limited and no studies have explored this during prehabilitation. This is a gap in the evidence. A recent study[83], [84] examined the impact, acceptability, practicability and implementation of a training intervention, designed using the Behaviour Change Wheel, on the delivery of VBA on physical activity by nurses to cancer patients. The 60-minute training intervention 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 MECC agenda and is relevant to all health and care professionals working in the prehabilitation setting.

Summary and consensus statement

- Health and care professionals involved in referral to, or delivery of, prehabilitation should have education and training to support behaviour change at each patient contact
- GRADE D – STRONG

Enhancing the reporting and subsequent design of interventions in prehabilitation

The evidence above clearly presents that prehabilitation interventions have the potential to positively influence patient outcomes. Variability in intervention components however, is a limiting factor of the extant evidence base as regards the effectiveness of prehabilitation interventions[2], especially those focused on improving psychological outcomes[33]. Alongside robust research design, the reporting of prehabilitation intervention components in people with a cancer diagnosis must be of the highest standard to enhance evidence quality and to accelerate the translation of what works into clinical pathways. In this regard, it is important that lessons are learned from across

the extant health-related literature, where the quality of descriptions of interventions has in general been identified as remarkably poor [85]. In their recent Delphi survey of an international panel of experts, Hoffman and colleagues[85] identified that trial efficacy and replicability are influenced by the individual components of an intervention, but that these elements are often absent from study description or are poorly described. We strongly recommend that all components of prehabilitation interventions for people with a cancer diagnosis are reported according to the TiDiER framework [85]. This approach echo calls from The Consolidated Standards of Reporting Trials (CONSORT) 2010 statement [86]. As outlined previously in this manuscript, a number of techniques to support patient behaviour change (e.g. goal-setting [51], provision of education[87], self-monitoring[37]) have also been adopted across the prehabilitation oncology literature, but few prehabilitation studies adequately describe or report the use of behaviour change techniques, thus making interventions difficult to replicate[58], [88]. Adoption of a Behaviour Change Technique Taxonomy[88] as a framework for the reporting of BCT's would enhance what is currently known about their effectiveness in prehabilitation in people with a cancer diagnosis. Options include the comprehensive 93 item taxonomy [48] and the CALO-RE framework [57] which has previously been used to code cancer intervention components [58]. The use of techniques to promote a change in and maintenance of a specific behaviour should also be underpinned by behaviour change theory [64], [89], [90] but there are few examples [91] of this reported within the prehabilitation literature as previously reported here. The absence of a theoretical underpinning for interventions at the outset makes it difficult to understand which techniques to implement[92] and the mechanism through which behaviour might be expected to change. The reporting of the link between theory, determinants, strategies and intervention aims or outcomes, needs to be enhanced and this view is supported by the broader field of behaviour change in physical activity [89].

In light of the infancy of the evidence for prehabilitation, it is also important to take steps to increase the scientific confidence in reported outcomes and ensure that the internal validity and reliability of interventions is well understood [93]. This will not only reduce costs downstream in the research process but is likely to enhance the quality of intervention outcomes, improve retention and reduce attrition[93]. One approach to achieving this is through the adoption of a quality assurance or treatment fidelity framework. Treatment fidelity can help understand which factors of an intervention contribute to Type I and Type II errors[94] and also help avoid Type III errors; where the intervention is assumed to be ineffective when, in fact, the intervention was not delivered as intended [95]. The Behaviour Change Consortium suggest best practice for the monitoring of intervention includes five main components: (a) design; (b) training; (c) delivery; (d) receipt; and, (e)

enactment[96]. By assessing the treatment fidelity of prehabilitation interventions as they emerge as an area of research and clinical interest, it is hoped that the translation of knowledge into practice can be expedited[97]. Therefore, we propose that prehabilitation interventions for people with a cancer diagnosis should be evaluated against a recognised treatment fidelity framework such as that proposed by Borrelli (2012)[93].

Summary and consensus statement

- All components of prehabilitation interventions for people with a cancer diagnosis should be reported according to the Behaviour Change Technique Taxonomy and TiDiER framework and evaluated against a recognised quality assurance framework (e.g. Borrelli 2012[93])
- GRADE D - STRONG

Conclusion

This paper summarises the consensus view from Macmillan, RCoA, NIHR and international authors with an interest and expertise in prehabilitative psychological interventions. We have discussed the extant evidence base for the role of psychology, both in terms of psychological support and efforts to promote behaviour change (including improving attendance at and engagement with prehabilitation interventions) during the perioperative period for people with a cancer diagnosis. Evidence of the efficacy of psychological intervention in the preoperative period in cancer populations is in its infancy though shows promise for favourable impact on psychosocial outcomes, particularly anxiety and depression.

Patients with a pre-existing serious mental illness are likely to benefit greatly from early identification and tailored support. This underlines the importance of ensuring that people with a cancer diagnosis are screened for psychosocial risk factors and directed to appropriate support as early as possible in their cancer journey.

The opportunity to enhance the outcomes and replicability of prehabilitation programmes through a thorough and robust process of intervention reporting, including the application of BCT's and theory, is an area of great potential. None of the studies included in the evidence synthesis reported the 'active ingredients' of the exercise, nutrition or psychological components of interventions according to a recognised BCT taxonomy and few studies provided information as to how and if theoretical frameworks were used to develop or tailor intervention content to promote behaviour change. The content and quality of training of health and care professionals in psychological support and behaviour change techniques to increase uptake and adherence to prehabilitation is also unclear

and therefore enhancing these aspects of treatment fidelity should be a priority for the research and practice communities.

It is recognised that these consensus statements should be interpreted in relation to the evidence from which they were derived, which for the use of psychological intervention in prehabilitation is in its infancy and largely heterogeneous in nature. There is a lack of high-quality data from robust studies with long-term follow-up beyond the prehabilitation period. With this in mind the statements of consensus here are intended as much to stimulate research and debate, so that future iterations continue to enhance the standard of care for patients during the prehabilitative period, as to represent guidance to support the patient psychologically for treatment and facilitate changes to behaviour that lead to longer-term improvements in quality of life.

References

- [1] M. P. W. M. Grocott, J. J. O. M. Plumb, M. Edwards, I. Fecher-Jones, and D. Z. H. D. Levett, "Re-designing the pathway to surgery: better care and added value," *Perioper. Med.*, vol. 6, no. 9, p. 1, 2017.
- [2] J. K. Silver, J. Baima, and R. S. Mayer, "Impairment-driven cancer rehabilitation: an essential component of quality care and survivorship," *CA. Cancer J. Clin.*, vol. 63, no. 5, pp. 295–317, 2013.
- [3] C. Treanor, T. Kyaw, and M. Donnelly, "An international review and meta-analysis of prehabilitation compared to usual care for cancer patients," *J. Cancer Surviv.*, vol. 12, no. 1, pp. 64–73, 2018.
- [4] S. HR., "Depression in cancer patients: pathogenesis, implications and treatment (review)," *Oncol Lett*, vol. 9, pp. 1509–1514, 2015.
- [5] P. MJ., "Identifying and assessing anxiety in pre-operative patients," *Nurs Stand*, vol. 23, pp. 35–40, 2009.
- [6] I. D. P. K. A. P. G. Mavros M. N. A. S; Gkegkes and F. ME, "Do Psychological Variables Affect Early Surgical Recovery?," *PLoS One*, vol. 6, no. 5, 2011.
- [7] H. Y. Ip, A. Abrishami, P. W. Peng, J. Wong, and F. Chung, "Predictors of postoperative pain and analgesic consumption: a qualitative systematic review," *Anesthesiology*, vol. 111, no. 3, pp. 657–677, 2009.
- [8] A. Hinrichs-Rocker, K. Schulz, I. Jarvinen, R. Lefering, C. Simanski, and N. EA., "Psychosocial predictors and correlates for chronic post-surgical pain (CPSP) - a systematic review," *Eur. J. Pain*, vol. 13, no. 7, pp. 719–730, 2009.
- [9] G. H. Montgomery, J. B. Schnur, J. Erlich, M. A. Diefenbach, and B. DH., "Presurgery psychological factors predict pain, nausea, and fatigue one week after breast cancer surgery," *J. Pain Symptom Manage.*, vol. 39, no. 6, pp. 1043–1052, 2010.
- [10] J. P. Gouin and K.-G. JK., "The impact of psychological stress on wound healing: methods and mechanisms," *Immunol. Allergy Clin. North Am.*, vol. 31, no. 1, pp. 81–93, 2011.
- [11] A. Waller, K. Forshaw, J. Bryant, M. Carey, A. Boyes, and R. Sanson-Fisher, "Preparatory education for cancer patients undergoing surgery: A systematic review of volume and quality of research output over time," *Patient Educ. Couns.*, vol. 98, 2015.
- [12] C. Foster *et al.*, "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," *PLoS One*, vol. 11, no. 5, 2016.

- [13] G. Nelson, J. Bakkum-Gamez, E. Kalogera, and others, "Guidelines for perioperative care in gynecologic/oncology: Enhanced Recovery After Surgery (ERAS) Society recommendations update," *Int. J. Gynecol. Cancer Publ. Online First*, Mar. 2019.
- [14] S. Van Rooijen *et al.*, "Multimodal prehabilitation in colorectal cancer patients to improve functional capacity and reduce postoperative complications: the first international randomized controlled trial for multimodal prehabilitation.," *BMC Cancer*, vol. 19, no. 1, p. 98, 2019.
- [15] E. Bloom, "Prehabilitation evidence and insight review," 2018.
- [16] G. H. Guyatt, A. D. Oxman, G. E. Vist, and others, "Grade: an emerging consensus on rating quality of evidence and strength of recommendations," *BMJ*, vol. 336, pp. 924–926, 2008.
- [17] P. H. Rosenberger and others, "Psychological factors and surgical outcomes: an evidenced-based literature review," *J. Am. Acad. Orthop. Surg.*, vol. 14, pp. 397–405, 2006.
- [18] S. F. Khuri and others, "Determinants of long-term survival after major surgery and the adverse effect of postoperative complications," *Ann. Surg.*, vol. 242, no. 3, pp. 326–341, 2005.
- [19] D. Z. H. H. Levett and C. Grimmett, "Psychological factors, prehabilitation and surgical outcomes: Evidence and future directions," *naesthesia*, vol. 74, no. Supp 1, pp. 36–42, 2019.
- [20] L. M. H. S. C. Network and T. C. S. T. for London, *Psychological support for people living with cancer: Commissioning guidance for cancer care in London*. 2015.
- [21] P. Salmon, L. Clark, E. McGrath, and F. P., "Screening for psychological distress in cancer: renewing the research agenda," *Psychooncology*, vol. 24, pp. 262–268, Aug. 2015.
- [22] N. C. C. Network, "NCCN clinical practice guidelines in oncology: distress management," vol. 2017.
- [23] C. S. Schuurhuizen *et al.*, "Screening and treatment of psychological distress in patients with metastatic colorectal cancer: study protocol of the tes trial," *BMC Cancer*, vol. 15, p. 302, 2015.
- [24] K. McCarter, B. Britton, A. L. Baker, and others, "Interventions to improve screening and appropriate referral of patients with cancer for psychosocial distress: systematic review," *BMJ Open*, vol. 8, 2018.
- [25] J. Walker, C. H. Hansen, P. Martin, and others, "Prevalence, associations, and adequacy of treatment of major depression in patients with cancer: a cross-sectional analysis of routinely collected clinical data," *Lancet Psychiatry*, vol. 1, pp. 343–350, 2014.
- [26] P. Alexandra, S. Sahil, H. Nicholas, and H. Andrew, "Depression and anxiety in patients with cancer," *BMJ*, vol. 361, 2018.

- [27] D. W. Kissane, M. Maj, M. R. Sartorius NDiMatteo, and H.-Z. KB., "Impact of depression on treatment adherence and survival from cancer," in *Depression in Cancer*, Kissane DW, M. Maj, and N. Sartorius, Eds. Depression and cancer.1st ed. -Blackwell: Wiley, 2011, pp. 101–124.
- [28] J. C. Holland and Y. Alici, "Management of distress in cancer patients," *J Support Oncol*, vol. 8, pp. 4–12, 2010.
- [29] S. A. Cook, P. Salmon, G. Hayes, A. Byrne, and F. PL., "Predictors of emotional distress a year or more after diagnosis of cancer: A systematic review of the literature," *Psychooncology*, vol. 27, pp. 791–801, 2018.
- [30] C. Li *et al.*, "Impact of a trimodal prehabilitation program on functional recovery after colorectal cancer surgery: a pilot study," *Surg. Endosc.*, vol. 27, no. 4, pp. 1072–1082, 2013.
- [31] K. Shimizu, "Effects of Integrated Psychosocial Care for Distress in Cancer Patients," *Jpn. J. Clin. Oncol.*, vol. 43, no. 5, pp. 451–457, 2013.
- [32] Schuurhuizen C *et al.*, "Screening and stepped care targeting psychological distress in patients with metastatic colorectal cancer: The TES cluster randomized trial.," *J. Clin. Oncol.*, vol. 36, no. 15 Suppl, p. 3560, 2018.
- [33] I. Tsimopoulou *et al.*, "Psychological Prehabilitation Before Cancer Surgery: A Systematic Review," *Annals of Surgical Oncology*, vol. 22, no. 13. Springer New York LLC, pp. 4117–4123, 01-Dec-2015.
- [34] A. J. Mitchell, "Screening for cancer-related distress: When is implementation successful and when is it unsuccessful?," *Acta Oncol. (Madr)*, vol. 52, no. 2, pp. 216–224, 2013.
- [35] NHS England, "New quality of life measure for recovering cancer patients," 2017. [Online]. Available: <https://www.england.nhs.uk/2017/09/new-quality-of-life-measure-for-recovering-cancer-patients/>. [Accessed: 15-Oct-2019].
- [36] N. I. for Health and C. Excellence, "Guidance on Improving Supportive and Palliative Care for Adults with Cancer," May 2004.
- [37] C. Gillis *et al.*, "Prehabilitation versus rehabilitation: a randomized control trial in patients undergoing colorectal resection for cancer," *Anesthesiology*, vol. 121, no. 5, pp. 937–947, 2014.
- [38] M. Ibrahim *et al.*, "multidisciplinary preoperative teaching session for women awaiting breast cancer surgery. A quality improvement initiative.," *Rehabil. Process outcome*, vol. 7, 2018.
- [39] Nice, *Quality Outcomes Framework Serious Mental Illness June 2009*. 2009.
- [40] C.-K. Chang *et al.*, "A cohort study on mental disorders, stage of cancer at diagnosis and subsequent survival," *Open*, vol. 4, p. 4295, 2014.

- [41] Z. Klaassen *et al.*, “The impact of psychiatric utilisation prior to cancer diagnosis on survival of solid organ malignancies,” *Br J Cancer*, vol. 6, Mar. 2019.
- [42] K. E. Irwin and others, “Predictors of disruptions in breast cancer care for individuals with schizophrenia,” *Oncologist*, vol. 22, pp. 1374–1382, 2017.
- [43] J. Baillargeon and others, “Effect of mental disorders on diagnosis, treatment, and survival of older adults with colon cancer,” *J. Am Geriatr. Soc.*, vol. 59, pp. 1268–1273, 2011.
- [44] R. Cunningham, D. Sarfati, J. Stanley, and others, “Cancer survival in the context of mental illness: A national cohort study,” *Gen Hosp Psychiatry*, vol. 37, pp. 501–506, 2015.
- [45] K. E. Irwin, “The patients we have to see,” *Oncologist*, vol. 22, pp. 1020–1021, 2017.
- [46] L. Fallowfield, D. Ratcliffe, V. Jenkins, and S. J., “Psychiatric morbidity and its recognition by doctors in patients with cancer,” *Br. J. Cancer*, vol. 84, pp. 1011–1015, 2001.
- [47] K. E. Irwin *et al.*, “Bridge: Person-Centered Collaborative Care for Patients with Serious Mental Illness and Cancer,” *Oncologist*, vol. 24, no. 7, pp. 901–910, 2019.
- [48] S. Michie *et al.*, “The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions,” *Ann. Behav. Med.*, vol. 46, no. 1, pp. 81–95, 2013.
- [49] A. Bradley *et al.*, “Pulmonary rehabilitation programme for patients undergoing curative lung cancer surgery,” *Eur. J. Cardio-Thoracic Surg.*, vol. 44, no. 4, pp. E266–E271, 2013.
- [50] C. L. Granger *et al.*, “CAPACITY: A physical activity self-management program for patients undergoing surgery for lung cancer, a phase I feasibility study,” *Lung Cancer*, vol. 124, pp. 102–109, 2018.
- [51] B. T. Jensen, J. B. Jensen, S. Laustsen, A. K. Petersen, I. S. Sndergaard, and M. Borre, “Efficacy of a multiprofessional rehabilitation programme in radical cystectomy pathways: A prospective randomized controlled trial,” *Scand. J. Urol.*, vol. 49, no. 2, pp. 133–141, 2015.
- [52] T. Cornette *et al.*, “Effects of home-based exercise training on VO₂ in breast cancer patients under adjuvant or neoadjuvant chemotherapy (SAPA): a randomized controlled trial,” *Eur. J. Phys. Rehabil. Med.*, vol. 52, no. 2, pp. 223–232, 2016.
- [53] B. P. Chen *et al.*, “Four-week prehabilitation program is sufficient to modify exercise behaviors and improve preoperative functional walking capacity in patients with colorectal cancer,” *Support. Care Cancer*, vol. 25, no. 1, pp. 33–40, 2017.
- [54] H. Komatsu *et al.*, “Nurse Counseling for Physical Activity in Patients Undergoing Esophagectomy,” *Gastroenterol. Nurs.*, vol. 41, no. 3, pp. 233–239, 2018.
- [55] N. Digital, “Health Survey for England,” 2017.
- [56] S. Michie, L. Atkins, and R. West, *The Behaviour Change Wheel A Guide to Designing*

- Interventions*, 1st ed. London, Great Britain: SilverBack Publishing, 2014.
- [57] S. Michie, S. Ashford, F. F. Sniehotta, S. U. Dombrowski, A. Bishop, and D. P. French, "A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: The CALO-RE taxonomy," *Psychol. Heal.*, vol. 26, no. 11, pp. 1479–1498, 2011.
- [58] R. R. Turner *et al.*, "Interventions for promoting habitual exercise in people living with and beyond cancer," *Cochrane Database Syst Rev*, vol. 9, 2018.
- [59] C. L. Rock *et al.*, "Nutrition and physical activity guidelines for cancer survivors," *CA. Cancer J. Clin.*, vol. 62, no. 4, pp. 243–274, 2012.
- [60] G. B. Samdal, G. Eide, T. Barth, G. Williams, and E. Meland, "Effective behaviour change techniques for physical activity and healthy eating in overweight and obese adults; systematic review and meta-regression analyses," *Int. J. Behav. Nutr. Phys. Act.*, vol. 14, no. 1, p. 42, 2017.
- [61] C. Grimmett *et al.*, "Systematic review and meta-analysis of maintenance of physical activity behaviour change in cancer survivors," *Int. J. Behav. Nutr. Phys. Act.*, vol. 16, no. 1, pp. 1–20, 2019.
- [62] P. Craig, "et al., Developing and evaluating complex interventions: the new Medical Research Council guidance," *Br. Med. J.*, vol. 337, p. 7676, 2008.
- [63] NICE, "Behaviour change: general approaches," 2007.
- [64] National Institute for Health and Care Excellence., N. I. for Health, and C. Excellence, "Behaviour change: individual approaches," vol. 49, 2014.
- [65] L. T. Nguyen, K. Alexander, and P. Yates, "Psychoeducational Intervention for Symptom Management of Fatigue, Pain, and Sleep Disturbance Cluster Among Cancer Patients: A Pilot Quasi-Experimental Study," *J. Pain Symptom Manage.*, vol. 55, no. 6, pp. 1459–1472, 2018.
- [66] M. S. Sommer *et al.*, "Perioperative Rehabilitation in Operable Lung Cancer Patients (PROLUCA): A Feasibility Study," *Integr. Cancer Ther.*, vol. 15, no. 4, pp. 455–466, 2016.
- [67] World Health Organisation, "International Classification of Functioning, Disability and Health (ICF).," 2001.
- [68] A. Bandura, *Self-efficacy: The exercise of control*. New York, US: W H Freeman/Time Books/Henry Holt & c, 1997.
- [69] W. Miller and S. Rollnick, *Motivational Interviewing: Preparing People for Change*. New York: Guildford, 2002.
- [70] M. P. Kelly and M. Barker, "Why is changing health-related behaviour so difficult?," *Public Health*, vol. 136, pp. 109–116, 2016.

- [71] S. Michie, M. M. van Stralen, and R. West, "The behaviour change wheel: A new method for characterising and designing behaviour change interventions," *Implement. Sci.*, vol. 6, 2011.
- [72] W. Demark-Wahnefried, N. M. Aziz, J. H. Rowland, B. M. Pinto, and P. BM., "Riding the crest of the teachable moment: promoting long-term health after the diagnosis of cancer," *J. Clin. Oncol.*, vol. 23, no. 24, pp. 5814–5830, 2005.
- [73] J. Meneses-Echávez, E. González-Jiménez, J. Correa-Bautista, J. Schmidt-Río Valle, and R. Ramírez-Vélez, "Effectiveness of physical exercise on fatigue in cancer patients during active treatment: a systematic review and meta-analysis," *Cad. Saude Publica*, vol. 31, no. 4, pp. 667–81, 2015.
- [74] F. Dyt *et al.*, "Physical activity for cancer survivors: meta-analysis of randomised controlled trials," *BMJ*, vol. 344, 2012.
- [75] K. H. Schmitz *et al.*, "{A}merican College of Sports Medicine roundtable on exercise guidelines for cancer survivors," *Med. Sci. Sports Exerc.*, vol. 42, no. 7, pp. 1409–1426, 2010.
- [76] R. WCRFAIfC., *Diet and Nutrition, Physical Activity and Cancer: a Global Perspective*. Continuous Update Project Expert Report, 2018.
- [77] K. Williams, A. Steptoe, and J. Wardle, "Is a cancer diagnosis a trigger for health behaviour change?," *Br. J. Cancer*, vol. 108, no. 11, pp. 2407–2412, 2013.
- [78] Independent Cancer Taskforce, "Achieving world-class cancer outcomes: A strategy for England 2015-2020," 2015.
- [79] K. Williams, R. J. Beeken, and J. Wardle, "Health behaviour advice to cancer patients: The perspective of social network members," *Br. J. Cancer*, vol. 108, no. 4, pp. 831–835, 2013.
- [80] S. M. Burke, J. Brunet, C. M. Sabiston, S. Jack, G. Mpw, and W. MA., "Patients' perceptions of quality of life during active treatment for locally advanced rectal cancer: the importance of preoperative exercise," *Support. Care Cancer*, vol. 21, no. 12, pp. 3345–3353, 2013.
- [81] NHS, "Making Every Contact Count." [Online]. Available: <https://www.makingeverycontactcount.co.uk/training/e-learning/other-e-learning-resources/>. [Accessed: 20-Oct-2019].
- [82] N. C. F. S. Cessation and training, *National Centre for Smoking Cessation and Training*. London: Local stop smoking services e service and delivery guidance, 2014.
- [83] J. Webb, J. Foster, and E. Poulter, "Increasing the frequency of physical activity very brief advice for cancer patients. Development of an intervention using the behaviour change wheel," *Public Health*, vol. 133, pp. 45–56, 2016.
- [84] J. Webb, J. Hall, K. Hall, and R. Fabunmi-alade, "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*, vol. 139, pp. 121–133, 2016.
- [85] C. Hoffmann Tammy *et al.*, "Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide," *BMJ*, vol. 348, p. 1687, 2014.
- [86] K. Schulz, D. Altman, D. Moher, and C. Group, "CONSORT Statement: updated guidelines for reporting parallel group randomised trials," *BMJ*, vol. 340, p. c332, 2010.
- [87] E. Granziera *et al.*, "A multidisciplinary approach to improve preoperative understanding and reduce anxiety: A randomised study," *Eur. J. Anaesthesiol.*, vol. 30, no. 12, pp. 734–742, 2013.
- [88] S. Michie, M. Johnston, J. Francis, W. Hardeman, and M. Eccles, "From theory to intervention: mapping theoretically derived behavioural determinants to behaviour change techniques," *Appl. Psychol. An Int. Rev.*, vol. 57, no. 4, pp. 660–680, 2008.
- [89] S. Michie, R. N. Carey, M. Johnston, and others, "From theory-inspired to theory-based interventions: a protocol for developing and testing a methodology for linking behaviour change techniques to theoretical mechanisms of action," *Ann. Behav. Med.*, vol. 52, pp. 501–512, 2018.
- [90] D. Kwasnicka, S. U. Dombrowski, M. White, and F. Sniehotta, "Theoretical explanations for maintenance of behaviour change: a systematic review of behaviour theories," *Health Psychol. Rev.*, vol. 10, no. 3, pp. 277–296, 2016.
- [91] F. G. Stacey, E. L. James, K. Chapman, K. S. Courneya, and L. DR., "A systematic review and meta-analysis of social cognitive theory- based physical activity and/or nutrition behavior change interventions for cancer survivors," *J. Cancer Surviv.*, vol. 9, pp. 305–338, 2015.
- [92] R. Davis, R. Campbell, Z. Hildon, L. Hobbs, and S. Michie, "Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review," *Health Psychol. Rev.*, vol. 9, no. 3, pp. 323–344, 2015.
- [93] B. Borrelli, "The Assessment, Monitoring, and Enhancement of Treatment Fidelity In Public Health Clinical Trials," *J. Public Health Dent.*, vol. 71 (s1), pp. S52–S63, 2011.
- [94] A. J. Bellg, B. Borrelli, B. Resnick, J. Hecht, D. S. Minicucci, and M. Ory, "Treatment Fidelity Workgroup of the NIH Behavior Change Consortium Enhancing Treatment Fidelity in Health Behavior Change Studies: Best Practices and Recommendations From the NIH Behavior Change Consortium," *Heal. Psychol.*, vol. 23, no. 5, pp. 443–451, 2004.
- [95] R. P. Saunders, D. Ward, G. M. Felton, M. Dowda, and R. R. Pate, "Examining the link between program implementation and behavior outcomes in the lifestyle education for activity program (LEAP). ♦Evaluation and Program Planning," vol. 29, pp. 352–364, 2006.
- [96] K. Zvoch, "How Does Fidelity of Implementation Matter? Using Multilevel Models to Detect Relationships Between Participant Outcomes and the Delivery and Receipt of Treatment.,"

Am. J. Eval., vol. 33, no. 4, pp. 547–565, 2012.

- [97] M. B. Madson and others, “Measures of fidelity in motivational enhancement: A systematic review,” *J. Subst. Abuse Treat.*, vol. 31, no. 1, pp. 67–73.