Fit to Fight

Prehabilitation for the Cancer Survivorship Journey

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Prehabilitation is an emerging, evidence-based approach in cancer care that aims to optimise patients' physical, nutritional and psychological status between diagnosis and treatment. Increasingly embedded within modern oncology pathways, prehabilitation has demonstrated benefits in improving treatment tolerance, reducing complications and enhancing recovery. This manuscript examines the role of multimodal prehabilitation, with particular focus on sarcopenia, nutritional optimisation, exercise interventions and psychological support. A critical appraisal of the current evidence base highlights variability in outcomes across intervention types, with stronger consistency observed in exercise-based studies compared to nutrition alone. Integration into clinical pathways and alignment with national healthcare priorities are also discussed. Prehabilitation represents a paradigm shift towards proactive, patient-centred care across the entire survivorship continuum.

Introduction

A cancer diagnosis marks the beginning of a complex and often challenging survivorship journey, characterised by physical deconditioning, psychological distress, and increased vulnerability to treatment-related toxicity. Traditionally, cancer care has focused on treating disease, with less emphasis on preparing the individual for the physiological and psychological demands of treatment. However, there is growing recognition that outcomes are not solely determined by tumour biology, but also by the patient's baseline functional status and resilience.

The concept of being 'fit to fight' reflects a shift in oncology care towards proactive optimisation, ensuring that patients are in the best possible condition to undergo and recover from treatment. Prehabilitation embodies this approach, targeting the critical window between diagnosis and treatment to enhance physical fitness, nutritional status and psychological wellbeing.[1,2]

Framing prehabilitation within the survivorship journey extends its relevance beyond the pretreatment period, positioning it as the first step in the whole continuum of care. This aligns with contemporary healthcare strategies, including the NHS Long Term Plan, which emphasises prevention, patient empowerment and care delivery closer to home.[3] By embedding prehabilitation early in the cancer pathway, clinicians can support patients not only to withstand treatment but to recover more effectively, and maintain function and quality of life throughout survivorship.[4,5]

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The evidence for prehabilitation

A narrative review highlights that prehabilitation targets modifiable behavioural risk factors – 8 including physical inactivity, malnutrition, smoking, alcohol use and psychological distress – to enhance physiological reserve and improve surgical outcomes.[5] Importantly, multimodal, multidisciplinary approaches delivered during the preoperative 'teachable moment' are emphasised as key to reducing postoperative complications, length of stay and long-term functional decline.[6]

A large systematic review and network meta-analysis of 186 randomised controlled trials (n=15,684) demonstrated that exercise and nutritional prehabilitation are consistently associated with reductions in postoperative complications and length of hospital stay, with multimodal interventions showing the greatest improvements in physical recovery and quality of life.[6] Despite generally low certainty of evidence, findings were robust for exercise and nutrition components, supporting their central role in prehabilitation pathways.

Emerging evidence suggests that prehabilitation can yield clinically meaningful benefits within very short timeframes, with improvements in physical fitness and functional capacity demonstrated in as little as two weeks prior to cancer treatment.[7] This highlights the importance of implementing prehabilitation even within constrained pre-operative windows, particularly in oncology pathways where time to treatment is often limited.

The importance of muscle mass and sarcopenia in cancer

Sarcopenia is highly prevalent in cancer populations and is consistently associated with adverse outcomes, including increased chemotherapy toxicity, postoperative complications, prolonged hospitalisation and reduced survival.[4, 8-10] Importantly, skeletal muscle depletion has been shown to be a more reliable predictor of outcomes than body mass index alone.[11, 12]

The pathophysiology of cancer-associated sarcopenia is multifactorial, involving systemic inflammation, reduced nutritional intake, metabolic dysregulation and physical inactivity.[4] Given its prognostic significance, early identification is essential. Assessment strategies include imaging-based measures, handgrip strength, calf circumference, and functional performance tests such as gait speed and sit-to-stand assessments.[11] These tools provide clinically feasible approaches for identifying high-risk patients and monitoring response to intervention.

Delivery of prehabilitation

From this 'point of referral' to admission, multiple clinician contacts and opportunities exist to initiate and re-enforce prehabilitation initiatives, support and encourage patients in their efforts. This is the cross-sector working and 'making every contact count' (MECC) concept.[13] The MECC concept is particularly observed in the community and public health. Availability and accessibility to community gyms, charities and other community fitness services is essential. Delivering prehabilitation at existing community venues may be particularly appealing to patients wishing to avoid additional preoperative hospital visits.

Delivery of most existing prehabilitation programmes, hospital or community-based, are 'face-to-face' interventions. It is increasingly recognised that 'one size may not fit all'. Home-based alternatives is a potentially preferred option, as it includes flexibility and accessibility to a cohort of patients who otherwise would not have prehabilitation access. A systematic review concluded that home-based prehabilitation interventions attained similar outcomes to centre-based models.[14] There are also broader NHS initiatives to more widely utilise digital healthcare interventions and telemedicine, recognising growing internet utilisation and confidence among older patients.[15]

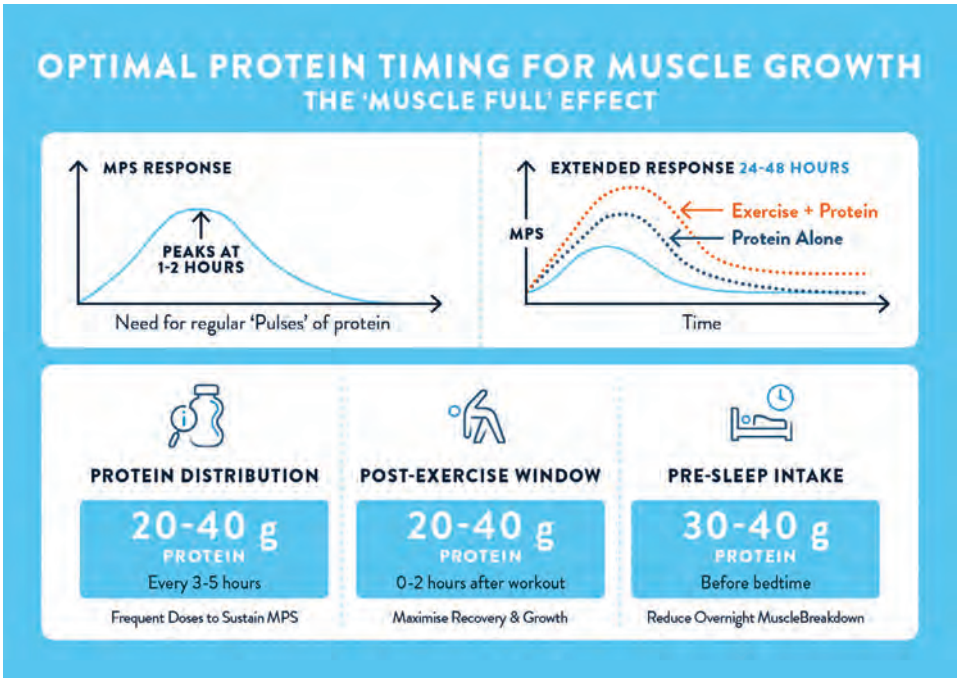
Nutritional optimisation in prehabilitation

Nutritional optimisation is a fundamental component of prehabilitation, particularly in addressing cancer-related malnutrition and sarcopenia. Current guidelines, including those from ESPEN,[16] recommend early nutritional screening and intervention, supported by evidence from multiple randomised controlled trials (RCTs) demonstrating improvements in clinical outcomes such as reduced post-operative complications and enhanced treatment tolerance.[6, 10]

Emerging evidence highlights that not only total protein intake but also protein timing distribution[12] and a leucine metabolite, β-hydroxy β-methylbutyrate (HMB), has demonstrated benefits in preserving muscle mass and function.[10, 17] A 2025 retrospective database review of 179 patients with cancer found that, among a subgroup of 155 receiving two daily servings of high-protein ONS with HMB, patients were 8 times less likely^ to experience interruptions in oncology treatment.*[10] Other recent oncology-specific evidence further supports its rol in attenuating muscle loss and improving functional outcomes.[10, 12]

Muscle protein synthesis (MPS) is based on protein quantity, quality and timing (see **Figure 1**). The responses to amino acid ingestion are transient, typically peaking within 1–2 hours before returning to baseline despite continued amino acid availability, a phenomenon described as the 'muscle full' effect.[12] This supports a strategy of evenly distributing protein intake across the day and the relevant timing consumption in relation to exercise. The type of protein intake is equally crucial; ingestion of rapidly absorbed proteins (e.g. whey) in the immediate post-exercise period enhances recovery, while slower-digesting proteins (e.g. casein) consumed prior to sleep may reduce overnight muscle protein breakdown.

Figure 1



While individual RCTs demonstrate the clear benefits of nutritional interventions, meta-analyses evaluating nutritional interventions in isolation report variable and often modest effects.[17] This inconsistency is largely attributable to heterogeneity in study design, patient populations, intervention protocols and outcome measures. Furthermore, many trials are limited by small sample sizes and short intervention durations, restricting generalisability.

These findings suggest nutritional intervention is biologically and clinically essential and have maximum benefit as part of a multimodal prehabilitation approach.[11, 17] Increasing evidence supports a synergistic effect when nutrition is combined with exercise, enhancing muscle protein synthesis and functional outcomes.[6, 10, 12]

Exercise interventions and physical fitness

Exercise represents a cornerstone of prehabilitation, with multiple RCTs demonstrating that structured exercise interventions improve cardiorespiratory fitness, muscle strength and functional capacity in cancer patients prior to treatment.[2, 6, 12] Meta-analyses further reinforce these findings, showing that exercise-based prehabilitation is associated with reduced postoperative complications and shorter hospital stays, particularly in surgical oncology populations.[6, 18]

Notably, the most consistent and clinically meaningful benefits are observed in multimodal prehabilitation programmes that integrate exercise with nutritional support.[5]

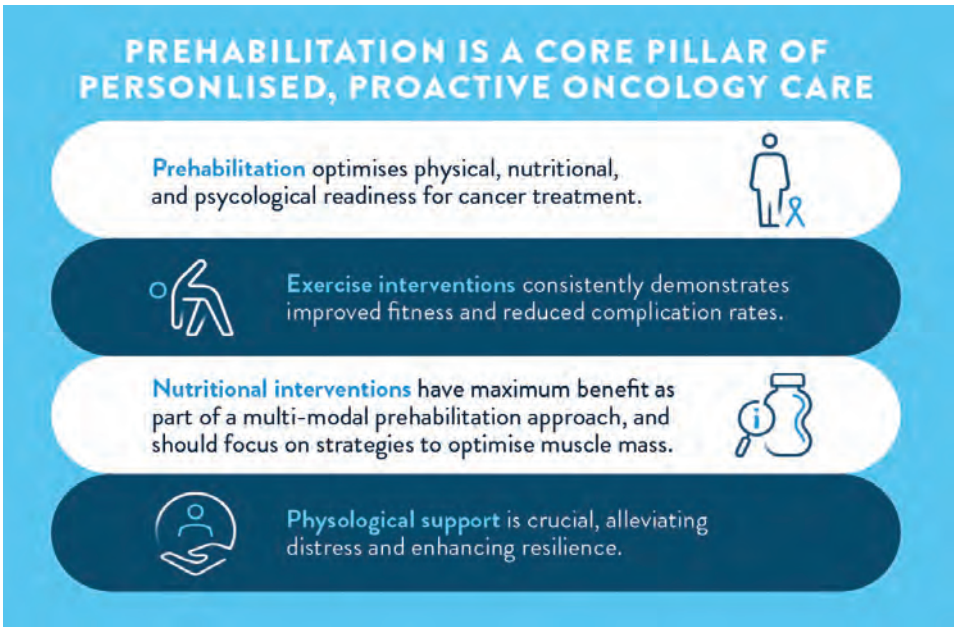
Psychological prehabilitation

The psychological burden of a cancer diagnosis is substantial, with high prevalence of anxiety, depression and distress.[19] Psychological prehabilitation aims to enhance resilience and coping capacity prior to treatment through interventions such as cognitive behavioural therapy, counselling and mindfulness-based strategies.[20]

Although the evidence base is less extensive compared to exercise, existing studies and systematic reviews suggest that psychological interventions improve patient-reported outcomes and may reduce perioperative stress.[19] As with nutrition, the greatest benefits are likely realised when psychological support is integrated within a multimodal framework.

Conclusion

Prehabilitation represents a transformative approach in cancer care, shifting from reactive management to proactive optimisation. While exercise interventions demonstrate the most consistent evidence across RCTs and meta-analyses, nutritional and psychological interventions remain essential components of a comprehensive strategy. The greatest benefits are achieved through multimodal programmes that address the complex needs of cancer patients. Integration into routine clinical practice offers significant potential to improve outcomes, enhance patient experience, and increase healthcare efficiency across the survivorship journey.



^Odds ratio 0.12 compared to standard ONS. Changes in oncology treatment, p-value = 0.0128. In a retrospective database review. In a subgroup of cancer patients (n=155) with or at risk of malnutrition receiving Ensure Plus Advance at 2 servings daily combined with dietary counselling and exercise recommendations for 3-6 months.

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