



# Active Together

SERVICE EVALUATION REPORT

SEPTEMBER 2024

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# Foreword

Active Together is a prehabilitation and rehabilitation service designed with and for people with cancer in South Yorkshire. Initiated in Sheffield, and now expanding to include Barnsley, Doncaster and Rotherham, the service has supported hundreds of people with cancer to prepare for and recover from treatment.

Entering cancer treatment in poor health can severely impact survival rates and quality of life. With a cancer diagnosis often comes distress and uncertainty, making support even more critical. Within days of referral, Active Together conducts a comprehensive needs-led health assessment and offers tailored interventions that integrate physical, nutritional, behavioral, and psychological support. Interventions aim to enhance a person's readiness for and tolerance of treatments, optimising recovery and promoting quality of life beyond treatment. This vision, for a consistent and integrated rehabilitation (including prehabilitation) service for patients, has been a focus for South Yorkshire for over a decade.

From the cancer surgery perspective, Active Together builds upon improvements in preoperative assessment. This allows better risk benefit estimation, informed decision making and consent, supported by developments in theatre and postoperative critical care. Active Together also extends to those receiving other cancer treatment modalities, such as radiotherapy and systemic anticancer therapies, impacting and benefiting patient care and health outcomes across the cancer care continuum.

Active Together is now accepted as a normal part of cancer care in the region. This is a major achievement, given the first NHS patient only entered the service in 2022. The service has overcome the inevitable difficulties with acceptance that occur when introducing a new service to clinical specialities and different hospitals, demonstrating high take up across differing patient groups, ages and communities. This includes those patients living in areas of deprivation, with strongly positive patient feedback. Key to this success has been partnership between academics at Sheffield Hallam University, multi-professional clinicians from Sheffield Teaching Hospitals, the funders Yorkshire Cancer Research and commissioners from the South Yorkshire and Bassetlaw Integrated Cancer Alliance.

This report presents findings from the first phase of implementation, highlighting achievements, challenges and evaluating the impact of the service on patient outcomes and the wider system. In the future, the service must continue to develop and adapt to meet the needs of a wider range of patients, especially as cancer can be a long-term health condition. For now, it is important to celebrate what has been achieved and recognise that none of it would have been possible without the dedication, skill and commitment of a wide range of professionals employed both within the programme and the wider NHS. Together, with essential contributions and support of patients, carers, volunteers and Yorkshire Cancer Research, this group of staff have transformed the rehabilitation landscape for people with a cancer diagnosis in the region. For those involved Active Together has been an inspiring career highlight. As we reflect on all that has been achieved in such a short time, we are greatly encouraged by how many more people affected by cancer will benefit as Active Together continues to grow.

Professor Gary Mills  
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# 1 Executive Summary

## 1.1 Background

Cancer is a long-term health condition that currently affects more than three million people in the UK. Cancer treatment places a substantial demand on people's physical and psychological reserves. This can lead to complications following treatment, particularly for those who have pre-existing comorbidities or mental health conditions, require multiple medications, and are frail, older, or physically unfit.

Inequalities exist in treatment outcomes. These inequalities follow the social gradient, with people from the most deprived areas more likely to suffer poorer outcomes. Tackling these inequalities by improving the quality of and access to support for people with a cancer diagnosis is a health service priority.

Increasing evidence supports the role of rehabilitation (including prehabilitation) to enable patients to prepare well for treatment, maximise outcomes from treatment, and improve quality of life. Active Together is an evidence-based multi-modal rehabilitation service (including prehabilitation) for patients with cancer. It provides patients with physical activity, dietetic and psychological support before, during and after treatment. Person-centred care and behaviour change techniques are integrated into the service design to empower patients to adopt and maintain lifestyle changes. Active Together aims to optimise patients' health, physically and psychologically, before treatment and to support them in coping with and recovering well from treatment.

## 1.2 About the Report

This report presents findings from a two-year evaluation of the Active Together service delivered in Sheffield. The content considers how and why the service worked and which elements did not work as expected. Recommendations for how the service can be adapted and improved are provided.

## 1.3 Evaluation Approach

The Active Together service evaluation adopted a mixed-methods design comprising an outcome and process evaluation. The outcome evaluation was based on a single group, longitudinal design with comparative analysis against historical patient data and data from patients who declined to join the service. The historical patient datasets were matched to the Active Together patients by procedure and tumour malignancy. The process evaluation gathered information via service performance indicators, semi-structured interviews, patient and professional questionnaires, and focus groups. This data was used to explore how the service operated and identify contextual factors influencing its delivery and outcomes. The evaluation was conducted between March 2022 and May 2024.

## 1.4 The Impact of Active Together

### 1.4.1 Healthcare Professional Feedback

Healthcare professionals expressed positive feedback about Active Together, noting that it increased the likelihood of patients receiving curative cancer treatment. 93% of healthcare professionals considered the service well or very well integrated into the cancer care pathway. They also praised the simple referral process and the benefits the programme offers patients.

### 1.4.2 Referral, Acceptance, and Completion Rates

Active Together achieved strong referral and participation rates. Of 847 referrals, 81% of patients attended the service, with a 92% appointment attendance rate. A total of 43% of referrals came from Sheffield's most deprived areas (Index of Multiple Deprivation [IMD] deciles 1-3). Acceptance rates were 10-15% lower among high-deprivation groups (IMD deciles 1-3) compared to those in less-deprived areas (IMD deciles 8-10). Enhancing access to care and addressing health inequalities in underserved communities remains a priority for the service. Differences in acceptance rates between sex, age, or ethnicity groups were minimal. Completion rates were also high, with 93% of patients completing the prehabilitation phase and 62% completing all stages of the service.

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### 1.4.3 Patient Experiences

Patient feedback has been positive, with 97% reporting improvements in their health and wellbeing. Patients commended each aspect of the service: the physical activity components boosted energy and fitness, the dietary support provided valuable nutrition guidance, and the psychological support helped manage anxiety. Patients reported that the programme empowered them to feel healthier and more in control of their health.



The financial benefit to NHS acute services is valued at £1079.22 per patient, resulting in a net saving to the NHS of £366.36 per patient.

### 1.4.4 Patient Outcomes

The Active Together service improved patient outcomes. Participants demonstrated increases in cardiorespiratory fitness, muscular endurance and lower body strength, along with reduced levels of fatigue and reduced symptoms of anxiety, low mood, and depression. The one-year survival rate for those in the programme was 95%, compared to 85% for patients who declined participation and 92% for a historical patient dataset. Data suggests that more than 50% of those who declined the service did so because they were self-managing, as opposed to being less well and unable to take part.

### 1.4.5 Healthcare Resource Use

The service demonstrated a positive impact on healthcare resource utilisation. Patients undergoing upper gastrointestinal (GI) surgery experienced shorter stays in critical care (0.54 and 0.40 fewer days than declined and historical patients, respectively) and shorter hospital stays overall (0.23 and 1.61 fewer days, respectively). Similarly, patients undergoing colorectal surgery spent 0.39 and 0.32 fewer days in critical care than declined and historical patients, respectively, and 1.76 and 0.43 fewer days in hospital overall. This suggests more efficient recovery times and less use of healthcare facilities. Furthermore, savings only refer to those costs related to the stay in hospital post-surgery. There are likely longer-term savings that were not captured directly here, such as reduced primary healthcare costs, reduced social care costs, and earlier return to work.

### 1.4.6 Cost Benefit Case

Delivering the Active Together service costs £712.86 per patient. The financial benefit to NHS acute services is valued at £1079.22 per patient, resulting in a net saving to the NHS of £366.36 per patient. These savings are primarily attributed to reduced time in critical care and fewer bed nights per surgical procedure.

93% of healthcare professionals considered the service well or very well integrated into the cancer care pathway.

### 1.4.7 Fidelity of Service Delivery

The evaluation used a comprehensive framework, incorporating interviews, surveys, focus groups, and observations to assess how consistently and accurately the service was delivered. This examination showed that the service adhered to its protocol at least 80% of the time, demonstrating high reliability and effectiveness. This included implementing tailored behaviour change techniques and person-centred care throughout the Active Together pathway. In response to patient feedback and growing demand, 12 protocol adjustments were made, for example recruiting additional physiotherapists to handle higher volumes of complex cases. The COVID-19 pandemic also prompted adaptations to ensure patient safety, including virtual sessions and social distancing measures.

## 1.5 Conclusion

The Active Together service has demonstrated a meaningful impact on outcomes for people with a cancer diagnosis who are treated in Sheffield. The service has also established trust amongst patients and clinicians and has become embedded within existing care pathways. The service did not exacerbate known inequalities in terms of access for and engagement with people living in the most disadvantaged communities. With a positive return on investment and potential for broader healthcare benefits, the service value has been established. Feedback from patients and healthcare professionals further supports its continued implementation and expansion.

## 2

# About This Report

This report explores the implementation and outcomes of ‘Active Together’, a multi-modal cancer rehabilitation (including prehabilitation) service. Data was captured between March 2022 and May 2024, reflecting the real-world application of the service.

The evaluation was carried out by an academic team at Sheffield Hallam University’s Advanced Wellbeing Research Centre, who were also involved in delivering aspects of the service. This close relationship allowed for continuous service improvement but meant the evaluation was not independent. This was a service evaluation, not a clinical research trial. Therefore, findings should be considered without a randomised control group. Patient participation in the evaluation was voluntary, and some data was self-reported, both carrying inherent biases.

The insights provided in this report into the successes and challenges of the service add valuable knowledge to the field of cancer care. The report highlights best practices and identifies areas for service improvement, providing a resource for understanding how prehabilitation and rehabilitation can enhance patient outcomes.

This report provides commissioners and policymakers with real world, valid evidence that can be used to shape effective cancer care strategies, help reduce health disparities and improve long-term patient outcomes.

Yorkshire Cancer Research funded the service.



## 3

# Background

In the UK, over 385,000 people are diagnosed with cancer annually. While advancements in treatment have improved survival rates, many patients still face complex health challenges that hinder recovery. Most patients with curative cancer undergo surgical procedures, with approximately 30% developing post-operative complications that delay discharge (1). Complications inflate costs (via longer hospital length of stay, more interventions, and increased readmissions) and vastly worsen patient experiences.

Cancer treatment outcomes vary by procedure and patient fitness (2). This is unsurprising given the physiological and psychological strains of cancer and cancer treatments (3) and that high-risk groups (e.g. frail and unfit) do not have sufficient physiological resilience. The distribution of high-risk individuals is linked to socioeconomic status, age, and comorbidities. In part, this explains differences in cancer survival across the UK, with the least disadvantaged living six months longer than the most disadvantaged in the three years after diagnosis (4).

Rehabilitation (including prehabilitation) is a multi-modal approach aiming to help patients prepare for treatment, maximise its benefits, and reduce side effects, improving their quality of life (5). Rehabilitation typically includes exercise, dietetics and psychological support. Evidence shows that regular physical activity and a healthy diet before, during, and after treatment can also lower the risk of recurrence and improve overall survival (6). Despite this evidence, few rehabilitation services are currently integrated into clinical pathways, and even fewer are commissioned or funded by the NHS. The Active Together service aimed to address this by testing the delivery of multi-modal rehabilitation (including prehabilitation) in a real-world setting. The service was collaboratively developed over two years with input from cancer patients, clinical and professional stakeholders, and academics (7).



This report provides commissioners and policymakers with real world, valid evidence that can be used to shape effective cancer care strategies, help reduce health disparities and improve long-term patient outcomes.

# What is Active Together?

## 4.1 Design of the Active Together Service

Active Together is an evidence-based, person-centred, multi-modal rehabilitation (including prehabilitation) service for individuals with a curative cancer diagnosis. The programme offers comprehensive support, including physical activity, dietetics, and psychological care, tailored to different stages of treatment: prehabilitation (following diagnosis), maintenance (during treatment), restorative (immediately post-treatment), and supportive rehabilitation (post-treatment and discharge). This support period can exceed 12 months, and needs are regularly re-assessed throughout the service pathway (Figure 1). The median number of days spent in each phase was 37 for prehabilitation, 69 for maintenance, 102 for restorative and 97 for supportive.

### 4.1.1 The Delivery Team

The service is delivered and supported by a multidisciplinary team, including physiotherapy, dietetics, clinical psychology, exercise professionals and administrative staff. The Active Together service integrated professionals from Sheffield Hallam University, Sheffield Teaching Hospitals NHS Foundation Trust, and Yorkshire Cancer Research. Each organisation contributed unique strengths to the service. The University provided evidence-based prehabilitation protocols, advanced facilities, and skilled staff in research, project management and fitness. Sheffield Teaching Hospitals NHS Foundation Trust ensured seamless patient care through established hospital relationships and specialised staff in physiotherapy, dietetics, and psychology. Yorkshire Cancer Research contributed funding, resources, brand development, and advocacy to enhance the patient experience. This model effectively merged diverse expertise, demonstrating a robust, innovative approach that was both practical and research-driven.

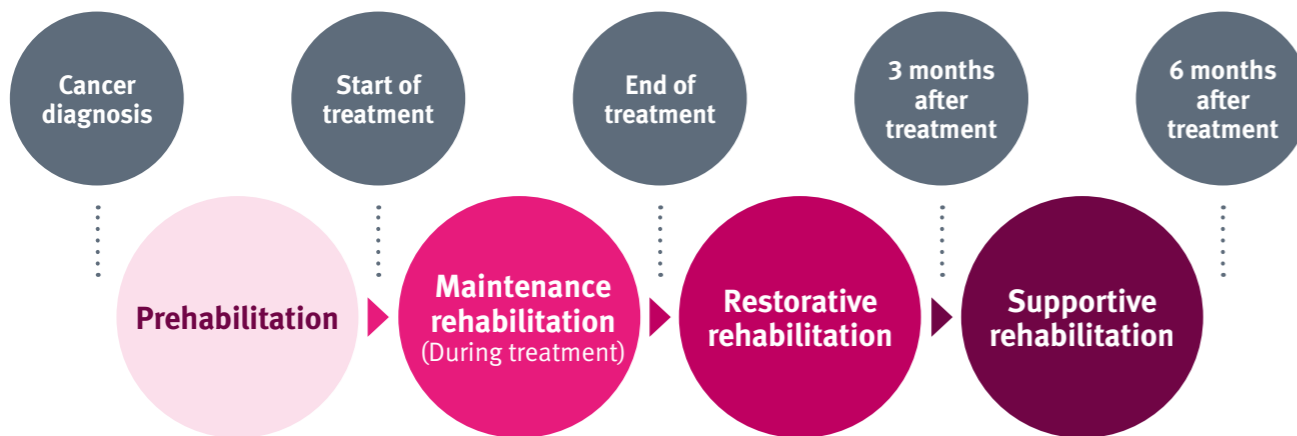


Figure 1. The Active Together service pathway and assessment points (grey circles).

### 4.1.2 The Location of the Active Together Service

The service supports patients treated in Sheffield but who live across South Yorkshire and the surrounding areas. South Yorkshire is a densely populated region of 1.4 million people, comprising Sheffield, Rotherham, Barnsley and Doncaster. The region has a long legacy of heavy industry, and over a third of its residents live in areas of high deprivation (8). The region has higher-than-average cancer rates (9), lower life expectancy, and a greater prevalence of chronic conditions. In 2020, approximately 9,000 new cancer cases were reported in South Yorkshire (10). Early-stage diagnosis rates are low (9), and cancer mortality exceeds the national average (11).

In South Yorkshire, Sheffield Teaching Hospitals NHS Foundation Trust is the main tertiary treatment centre for cancer. It delivers specialist oncology interventions via Weston Park Cancer Care and performs the region's most major and complex surgeries across its other hospitals (12). Patient pathways can, therefore, be complex, involving multiple hospitals and treatment teams coordinating care across the county. Building a prehabilitation and rehabilitation service into these pathways has required significant support, cooperation, and engagement across all four regional NHS Trusts (Sheffield, Barnsley, Doncaster, and Rotherham). Active Together is the first service to provide prehabilitation and rehabilitation to cancer patients in South Yorkshire.

The Active Together service began delivery from Sheffield Hallam University's Advanced Wellbeing Research Centre, which is located in Darnall. Darnall is a disadvantaged area in Sheffield with elevated rates of mortality and cancer. In response to patient demand, Active Together expanded to additional community venues across Sheffield, including Graves, Concord, and Wisewood leisure centres, chosen based on patient accessibility.

Active Together is the first service to provide prehabilitation and rehabilitation to cancer patients in South Yorkshire.

## 4.2 Referral and Needs Assessment

Adults with a primary diagnosis of lung, colorectal, or upper gastrointestinal (GI) cancer and scheduled for curative treatment in Sheffield were referred to Active Together following decision to treat. Referrals were completed by healthcare professionals, including cancer nurse specialists, consultants, and allied healthcare professionals at Sheffield Teaching Hospitals NHS Foundation Trust. The healthcare professionals were asked to refer all patients meeting the above criteria to avoid excluding anyone based on underlying biases (e.g., a perceived ability to engage in exercise).

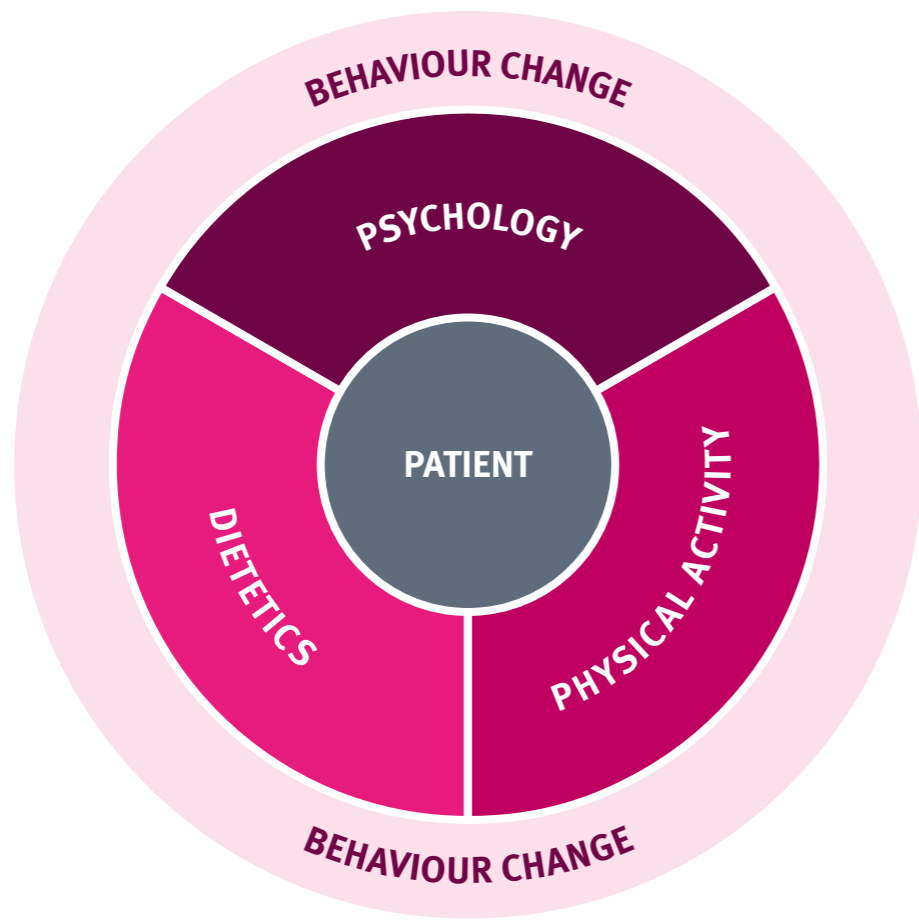
Once referred, all patients were contacted within 48 hours and scheduled for an initial needs assessment with a physiotherapist within 7-8 working days. The needs assessment process is outlined in the published protocol (7). Patients were assessed against criteria that determined their physical, nutritional, and psychological status. Based on patient responses, an algorithm (supported by clinical expertise) was used to determine the level of support required using a traffic light system: Green/universal (low complexity), Amber/targeted (moderate complexity), or Red/specialist (high complexity). The goals of each service component are detailed in Appendix 1 and outlined below.

## 4.3 Physical Activity Support

Physical activity support forms a significant part of the service's resources, provided by a team of physiotherapists and fitness instructors. For patients with the highest needs, physiotherapists deliver specialised one-to-one care, while fitness instructors offer a range of exercise options tailored to patients with moderate to low needs. These include in-person one-to-one sessions, group sessions (both in-person and online), pre-recorded online videos, and personalised exercise programmes that can be undertaken at home.

## 4.4 Dietetic Support

Active Together provides comprehensive dietetic support to address the needs of patients. Tailored dietetic care is available for those with higher needs, ensuring they receive expert guidance to manage their health effectively. Alongside individualised care, the service offers workshops and general advice to help patients make informed dietary choices, maintain a balanced diet, and manage treatment-related side effects. These sessions equip patients with the knowledge and skills to enhance their overall wellbeing throughout and beyond their treatment journey.



#### 4.5 Psychological Support

The service integrates psychologically informed approaches into all patient contacts. All delivery staff completed the recommended Level 2 Psychological Skills training (13). This training covers foundational skills in basic psychological interventions. Patients are also provided with various resources, both online and in print, to support them with managing emotions, symptoms of anxiety, and fatigue. For additional support, patients are signposted or referred to local cancer charities or primary mental health services for Level 3 interventions. These interventions involve advanced techniques for complex cases. Staff are trained to recognise when escalation is necessary, with access to a clinical psychologist serving as the primary escalation point. A clinical psychologist, embedded within the team, offers brief Level 4 input, including assessment, formulation, and brief interventions for a small number of patients who are struggling to engage with the service or their treatment due to their psychological distress. Additionally, the clinical psychologist conducts reflective practice sessions every six to eight weeks to support staff wellbeing.

#### 4.6 Behaviour Change

The Active Together service has incorporated behaviour-change principles into its design to identify and target specific behaviours. This approach aims to empower patients to adopt and maintain lifestyle changes. Staff underwent training to ensure effective delivery. All patient interactions within the Active Together service are conducted using a patient-focused approach called Motivational Interviewing (MI) (14). This embraces the principles of collaboration, compassion, evocation, and acceptance—the core elements of MI. Additionally, the service aimed to integrate the “What Matters to You?” approach (15), promoting patient-centred care and shared decision-making. This approach was designed to foster patient empowerment and a sense of control. The behavioural elements of the service were structured using the behaviour-change wheel (16), ensuring that interventions were appropriately tailored to support patients in making sustainable lifestyle changes throughout their cancer journey.

For a comprehensive outline of the design of Active Together and the behaviour change components, please refer to the published development and design paper (7).

# 5 Evaluation Approach

## 5.1 Methods

The Active Together service evaluation adopted a mixed-methods design comprising an outcome and process evaluation. The outcome evaluation was based on a single group, longitudinal design with comparative analysis against historical patient data. The historical patient data were matched to the Active Together patients by procedure and tumour malignancy. The primary aim of the outcome evaluation was to determine the impact of the Active Together service on patient outcomes, patient-reported outcomes, and clinical endpoints, as well as exploring benefits to the wider health system (e.g. health care resource use).

The process evaluation utilised service performance indicators, semi-structured interviews and focus groups to explore mechanisms of action and understand contextual factors influencing delivery and outcomes. The primary aim of the process evaluation was to understand what aspects of the service did or did not work and why, as well as contribute to the interpretation of the outcome evaluation findings.

The process evaluation also employed a comprehensive fidelity framework (17) to conduct an in-depth interrogation of the integrity of the service. Utilising fidelity methods in cancer services and non-research settings is rare, making it a novel aspect of the evaluation.

Please see the published evaluation protocol for a complete description of the evaluation methods (18).

## 5.2 Data Analysis outline

Patients were assessed at five time points across the service pathway (Figure 1; grey boxes). Assessments were conducted by either a physiotherapist or a fitness instructor. Patients completed questionnaires at each time point and undertook supervised health-related and physical function assessments capturing physical, nutritional, and psychological outcomes. The changes to each outcome variable over time were examined. Analyses were conducted using all available data for each comparison, as missing data was considered

to be missing at random. Changes from baseline are presented to account for the different cohorts analysed at each time point. Sample sizes for each comparison are available in Appendix 5. Secondary analyses were performed for each assessment measure to observe whether changes in each outcome were different by tumour groups, sex, ethnicity, index of multiple deprivation, and age, with results only presented if a significant difference was found. Details of data analysis methods are available in Appendix 2.

Sheffield Teaching Hospitals NHS Foundation Trust provided healthcare resource use and mortality data. Sub-group analyses were performed based on cancer type and people who entered or declined the service. Survival rates and healthcare resource use data were compared between Active Together service users, patients who declined the service, and historical patient groups matched by procedure and tumour malignancy. The hospital stay cost for each patient referred to Active Together was calculated using the methods described by Arabadzhyan and colleagues (19). HRG4+ National Costs Grouper was used to assign HRG codes to each spell and associated costs from the 2022-23 National Cost Collection data series.

A multifaceted approach was used to comprehensively understand professional and patient perspectives. Interviews were conducted with patients ( $n^* = 22$ ), healthcare professionals ( $n = 14$ ), and members of the Active Together team ( $n = 11$ ). The resulting data were analysed and organised into themes. Additionally, questionnaire responses were gathered from patients ( $n = 137$ ) and healthcare professionals ( $n = 43$ ). Common themes across all data sources were identified to provide insight into the fundamental components of how the service works.

To assess the extent to which Active Together was delivered as intended, sessions were observed to examine the core components of the service ( $n = 10$ ). Additionally, data from the above sources and a review of key service documents were checked against a pre-defined checklist to determine how closely the service aligned with its intended protocol (17).

*\*n = the number of people included.*

# 6

## Engagement with Active Together

### 6.1 How Well Did Healthcare Professionals Engage with Active Together?

Healthcare professionals reported strong satisfaction with the referral process for the Active Together service. A total of 68 healthcare professionals were contacted across the three tumour groups to complete a feedback survey. In total, 43 healthcare professionals responded, and 100% were satisfied with the referral process. The Active Together service's referral process was designed to be straightforward and time-efficient for healthcare professionals, ensuring a patient can access support quickly.

**“Our Clinical Nurse Specialists have done all the referrals, and they find it really easy to refer. And the fact that Active Together contact patients so quickly.”**

*Consultant, Sheffield Teaching Hospitals*

Interviews with healthcare professionals and survey data revealed that healthcare professionals had a strong understanding of the service's purpose. The implementation process was characterised by ease, underpinned by trust, effective communication, and collaboration, which helped referrals.

**“It works easily, and it's easy to refer to because we can do it online, it's no bother at all, it's very, very user-friendly.”**

*Clinical Nurse Specialist, Sheffield Teaching Hospitals*

Professionals emphasised the overwhelming need for the service to enhance patients' treatment experience and widen access to treatment options. Of the healthcare professionals surveyed (n = 43), 93% stated that Active Together was 'very well' or 'extremely well' integrated into their cancer pathway.

Active Together is now embedded into practice and the dedication that the team have shown whilst setting up the process has greatly improved our patient's sense of wellbeing. They feel like they are in an active part of their treatment.”

*Clinical Nurse Specialist, Sheffield Teaching Hospitals*

### 6.2 What Was the Reach of Active Together?

Up to April 30th, 2024, the Active Together service received 847 referrals for patients with colorectal, lung, and upper gastrointestinal (GI) cancer referrals. There were an additional 21 referrals that did not meet the service criteria. Of the 847 referrals, 162 declined to join the service, resulting in an overall acceptance rate of 80.9%. Of the 685 patients who entered the service, 36 opted out of NHS Data Sharing and were excluded from further analysis.

Upper GI and colorectal cancer patients had high acceptance rates (86.2% and 85.8%, respectively), and lung cancer patients had a slightly lower rate (72.7%). By comparison, these rates are notably higher than those seen in previous studies of cardiac and pulmonary rehabilitation programmes, which have uptake rates of 50% and 68%, respectively (20,21). There were minimal differences in acceptance rates between age groups, with the mean age of patients who declined the service being 69.1 years, compared to 67.7 years for patients who accepted. There were no differences in acceptance rates by sex (male = 81.4% and female = 80.3%). A detailed overview of referrals and acceptance rates categorised by tumour group and demographics is provided in Appendix 4.

Reasons for Declining or Leaving the Service

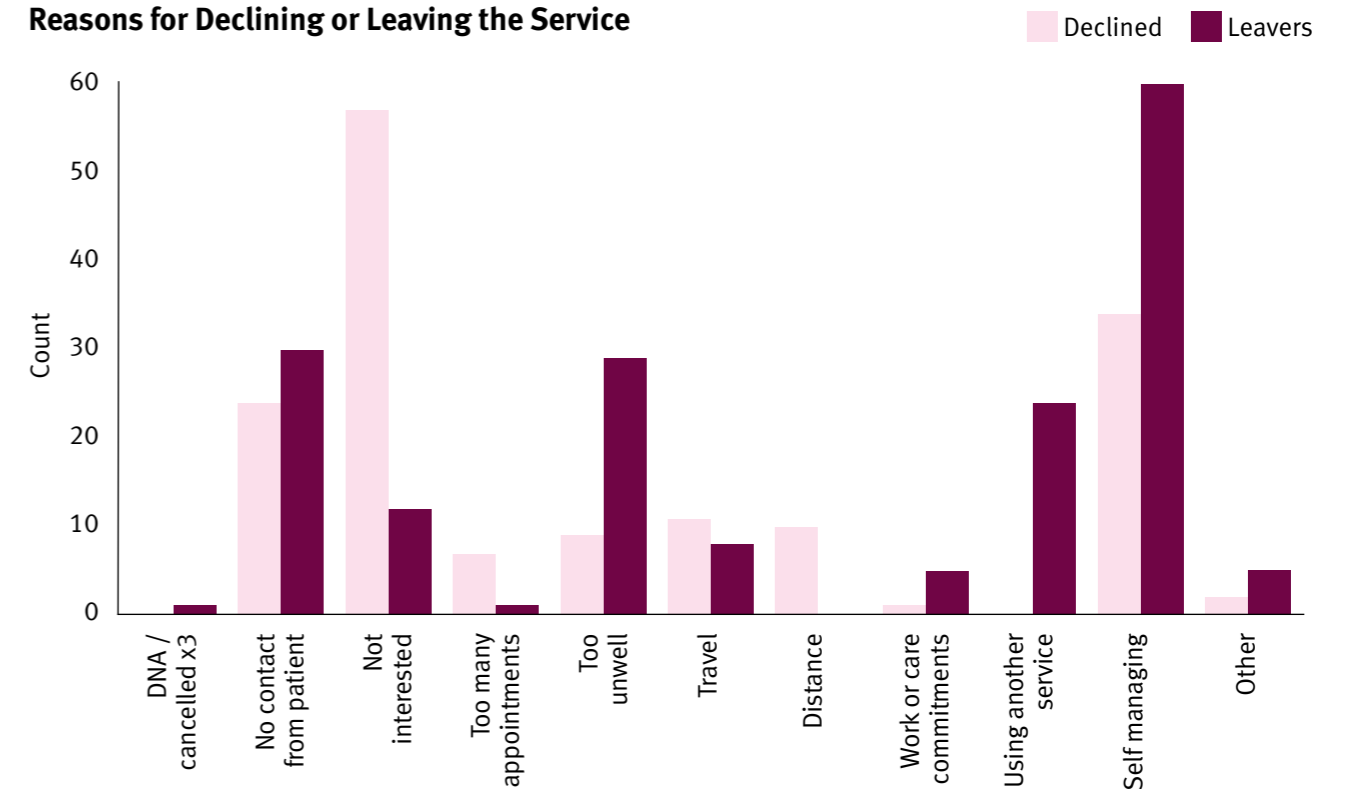


Figure 2. Reasons for declining or leaving the service before the end of the Active Together pathway.

Figure 2 shows why patients declined or left the service. A total of 69 patients did not provide a clear reason for declining or leaving ('Not interested'), and 29 said travel or distance to access the service was too far. Eight said they had too many appointments, and six said they had other commitments, all demonstrating the need to ensure the service was convenient for patients.

The ethnicity of patients engaging with the service showed that 84.7% identified as White, with 11.6% choosing not to state their ethnicity. Black and Asian patients each represented 1%, and those of Mixed ethnicity accounted for 0.5%. Compared to Sheffield's population, of 19.2% non-white, it suggests an underrepresentation of minority ethnic groups within the Active Together service (22). Minimal differences were observed in acceptance rates between ethnic groups (Appendix 4). On this basis, lower representation from some ethnicities is not reflective of the service but of the number of curative cancer patients in the pathway. The difference in referral rates is likely to be due to lower incidence rates of colorectal, upper GI and lung cancer in Black, Asian and Mixed/Multiple ethnicity groups compared to White ethnic groups in England (23). Nevertheless, there is a need to continue engaging with underrepresented minority groups to ensure inclusive access to treatment services, screening and early diagnosis.

The Active Together service reached patients living in some of the region's poorest communities. An analysis of the Index of Multiple Deprivation (IMD) scores showed that 43.2% of the referrals came from the lowest three IMD deciles, indicating they were from the most deprived areas. This demonstrates that the Active Together service engaged well with individuals facing the highest levels of social and economic disadvantage and contributed to reducing health inequalities by improving access to care for marginalised populations. Despite receiving most referrals for cancer patients living in disadvantaged communities, acceptance rates were approximately 10-15% lower in the most deprived compared to the least deprived areas (Figure 3), suggesting that these groups experience more barriers to participation. This may be due to travel or other responsibilities, as highlighted in Figure 2. The Active Together service has added more sites in key areas to address this issue.





### 6.3 How Well Did Patients Engage in Active Together?

Active Together had strong engagement across its different rehabilitation phases, with 62% of patients completing the full programme, with a median length of 44 weeks. 93% of participants completed the prehabilitation phase (median length = 5 weeks), while 80% engaged through the maintenance phase (during their treatment, median length = 10 weeks). These completion rates are favourable when compared to other rehabilitation programmes. As a comparison, pulmonary rehabilitation studies report attrition rates ranging from 31-43% during an 8-week programme (24) and exercise referral schemes see a 39-57% dropout rate over 12 weeks (25-27).

Active Together's completion rates are consistent with other cancer rehabilitation initiatives, such as the Prehab4Cancer programme, which reported a 73% completion rate for both the prehabilitation and rehabilitation phases (28). The low attrition rates for both services suggest that the person-centred and multi-modal approach supports patient engagement throughout their treatment journey. Additionally, non-completion of the programme does not necessarily indicate a negative outcome. Some patients may be considered "early completers," having derived sufficient benefit from the intervention and no longer requiring support. Data for the number of patients that left at each stage of the service is provided in Appendix 3.

#### Percentage of Total Referrals and Acceptance Rates Ranked by Deprivation

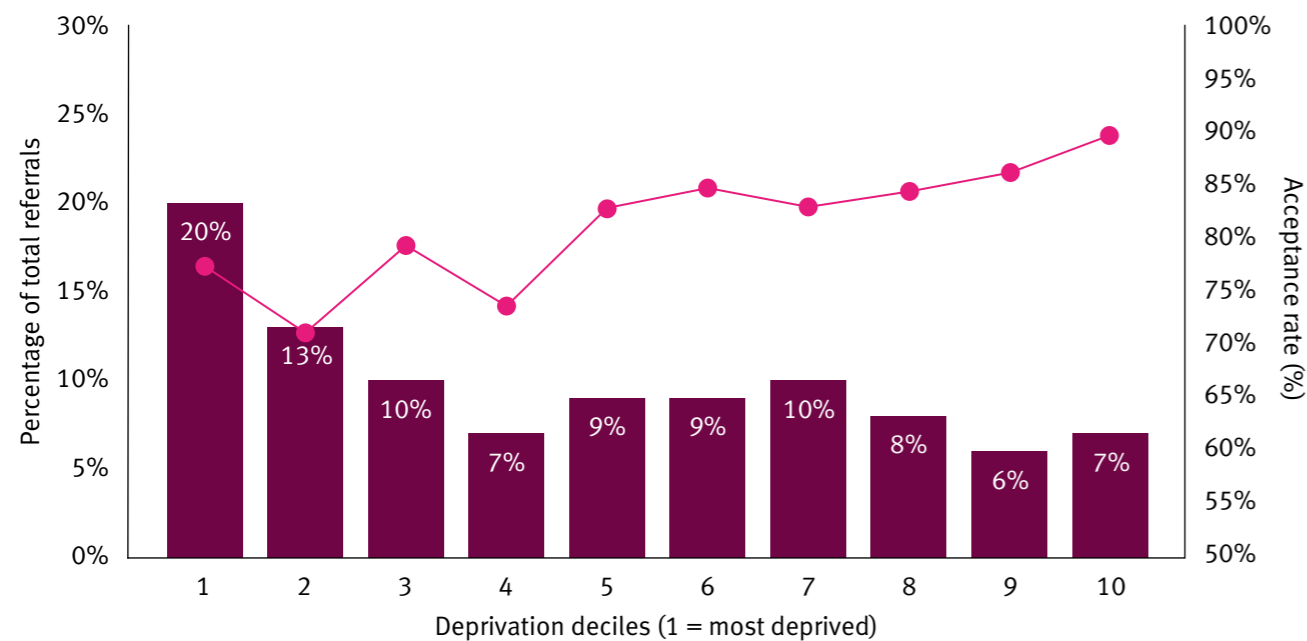


Figure 3. Percentage of total referrals and acceptance rates categorised by index of multiple deprivation deciles (lower decile = higher deprivation).

### 6.4 What Was the Patient's Experience of Active Together?

Patients found the referral and needs assessment process straightforward and appreciated the service's accessibility and quick communication.

**"It was very easy. It was just a case of...I received a phone call and asked me, when would be a good date for me to start and that was it. You know, they didn't say oh well, we can't book you in for three months. It was a case of, you know, when can you come? I think the whole process was quite easy, to be honest."**

*Male, aged 67, colorectal cancer*

Once patients' level of need had been assessed, the Active Together team developed a tailored programme that included physical activity, dietetic and psychological support. Patients did not universally receive all three support components but received those most appropriate to their needs. Patients felt that the service was tailored to their needs and that the exercise sessions were well-suited to their requirements, which helped patients feel motivated. The exercise intensity was validated through a sub-analysis of a patient cohort, which confirmed that the intensity ranged from light to moderate. Despite the recognised benefits of high-intensity exercise (29), the most robust data on the effects of exercise in cancer patients supports moderate-intensity exercise (30) due to its positive impact on outcomes while considering patient motivation and adherence.

**"...the exercises are at a measured pace, and you do what you feel you can do and they don't push you. It's not a case of come on, you need to work harder. It's just, you know, basically to try and get your fitness levels back up, which I've benefited from enormously, I'll be honest."**

*Male, aged 67, colorectal cancer*

Based on individual needs, patients were offered various support options, including one-on-one in-person sessions, in-person group sessions, online group sessions, pre-recorded online videos, and a personalised at-home programme. Patients reported that while online sessions were available, they benefited more from the in-person interactions.

**"I really look forward to the communal side of it, to go and meet people."**

*Female, aged 75, lung cancer*

They stated that being with others face-to-face helped them feel a stronger sense of belonging and support, building social connections and developing support networks.

**"Well just being part of the class, I think. It says it in the title doesn't it, Active Together. It's very encouraging."**

*Female, aged 83, colorectal cancer*

Patients praised the service's supportive and nurturing environment, highlighting that staff made patients feel supported. They appreciated the team's approachability, knowledge, and empathetic communication style. Patients noted a strong sense of personalised care, feeling listened to, understood, and motivated.

**"Friendly service with excellent values towards my care and personalised approaches to my needs."**

*Male, aged 70, lung cancer*

Most patients (97%) reported that the Active Together service positively impacted their health and wellbeing. The benefits most frequently noted by patients included improved knowledge of physical activity, increased energy levels, reduced fatigue, better control of their health, and helping others feel less worried. This highlights the services' effectiveness in empowering individuals to take ownership of their physical and mental wellbeing during the challenging experience of cancer and its treatment.



## Neil's Experience

“Taking part in Active Together created in me a new philosophical attitude. The exercise not only made me feel fit, but also made me feel like I was in control of my own destiny.”

Neil was told he would need to lose weight before he could safely have his cancer removed. He was referred to Active Together and in the space of eight weeks, Neil managed to significantly improve his fitness.

## 6.5 Summary

### 6.5.1 What Went Well

- Healthcare professionals reported that the referral process was well-designed, efficient, and straightforward. This positive feedback highlights the service's effectiveness in facilitating prompt access to care, contributing to the programme's overall success.
- The service effectively engaged with patients across various levels of deprivation and demographic groups. This broad reach underscores the programme's commitment to inclusivity and its success in addressing diverse patient needs, ensuring equitable access.
- Patients found the referral and needs assessment process straightforward, with high appreciation for the service's accessibility and prompt communication.
- Face-to-face interactions were particularly beneficial, fostering a sense of belonging, building social connections, and creating a supportive environment.
- Patients praised the supportive, nurturing environment and the staff for their approachability, knowledge, and empathetic communication, contributing to a strong sense of personalised care.

### 6.5.2 Recommendations for the Future

- Continue strengthening integration within the cancer pathway to ensure consistent and effective patient support.
- Continue efforts to engage underrepresented groups, particularly addressing the lower acceptance rates among high-deprivation groups compared to those in less deprived areas, to ensure that access to the service remains inclusive.
- Investigate patients who leave the service early, for reasons other than self-management, and refine strategies to ensure continued support and reduce barriers to full participation.
- Perform a full equality, diversity, and inclusion assessment of the service to ensure all underrepresented groups are examined and included.



# 7 The Impact of Active Together on Patient Outcomes

Cancer treatments can be aggressive, causing damage to both cancerous and surrounding healthy tissues. Therefore, patients' physical and psychological health will inevitably be adversely affected following treatment. A range of factors including treatment type and dose, treatment side effects or complications, age, and comorbidities, will influence the magnitude of this decline.

Median change from baseline is presented for each outcome measure, with group effects (by tumour group, sex, ethnicity, index of multiple deprivation, and age) only presented where significant differences were found.

## 7.1 What is the Impact of Active Together on Physical Function?

### 7.1.1 Aerobic Capacity

Patient feedback and quantitative data highlight the significant improvements in physical fitness achieved through Active Together. Patients discussed how increased physical function transformed their daily lives.

“...this time last year prior to doing any of this I couldn't even walk up to the post box on this road, because I was so out of breath. I have asthma as well, so it's a combination of the heart failure, asthma and obviously now this lung cancer. I was really struggling to breathe, and any sort of incline. Last weekend we went out to Denby Dale, and there's an old castle ruin, and I actually walked up to the top of this hill with my daughter and family.”

*Female, aged 75, lung cancer*

The six-minute walk test (6MWT) was used as a proxy measure of aerobic capacity (31). The greater the distance a patient can walk in six minutes, the fitter they are deemed to be and the lower the risk of treatment complications (32,33) and mortality (34). The median baseline was 487m for male and 411m for female patients. Figure 4 shows the change in 6MWT distance over time. Active Together successfully increased the patient's walking distance during the prehabilitation phase, with a median improvement of 27m. The minimum clinically important difference is estimated to be between 22-42m for people with lung cancer (35-38). Patients' walking distance was lower after treatment, compared to baseline (17m difference). However, this reduction was smaller than typically seen in patients who do not undergo prehabilitation (-28m, measured 4-8 weeks post-surgery; [39]). Encouragingly, during the post-treatment restorative and supportive phases, patients' walking distances increased, with a final median overall improvement of 20m above their baseline levels. This shows the service's positive impact on maintaining and enhancing patients' aerobic capacity throughout their cancer journey.

### 7.1.2 Lower Body Strength, Muscular Endurance and Frailty

Attendance at Active Together improved lower body strength and muscular endurance. Patients completed a 60-second sit-to-stand test to measure lower body muscular endurance (40), with the number of sit-to-stand repetitions in the first 30 seconds used to indicate lower body strength (41). The median number of repetitions in 60 seconds at baseline was 28.5 for male and 23 for female patients, which are both in the lowest quartile for people under 75 (40). The median number of repetitions in 30 seconds at baseline was 14.5 for male and 12 for female patients. There was a clear pattern of progress similar to the 6MWT, showing increased performance after prehabilitation, a temporary decline post-treatment, and recovery in the restorative and supportive phases of the service (Appendix 5). A median increase of  $\geq 2$  repetitions was achieved in both the 30s and 60s sit-to-stand tests after prehabilitation and the 60s sit-to-stand test after the restorative phase. Although specific reference values for cancer populations are lacking, these improvements are consistent with meaningful changes seen in other clinical populations, such as those with pulmonary disease (42,43).

Hand grip strength was measured as a proxy for frailty (44). Frailty is an important variable to assess as it can negatively affect cancer treatment in older patients (45). The median baseline hand grip strength for females was 20kg and 19kg for the dominant and non-dominant hand, respectively. The median baseline hand grip strength for males was 33kg and 32kg for the dominant and non-dominant hand, respectively. These values are in the lowest 10th percentile for males and females in the 65-69 age category (46) and indicate frailty (47). Dominant and non-dominant hand grip strength did not change significantly after prehabilitation, significantly decreased (-2kg) following treatment, and significantly increased during rehabilitation but did not return to baseline levels (-1kg) (Appendix 5). There were significant differences between sexes, with female patients more likely to return to an above baseline level (+0.9 kg) than male patients (-2.4 kg) at the post-supportive assessment.

Overall, the changes are smaller than the clinically important difference of 5-6.5 kg (48). Therefore, the changes in handgrip strength exhibited by Active Together patients are positive but relatively minor and did not reach statistical significance. These findings underscore the service's ability to maintain and improve lower body strength and muscular endurance. However, the results suggest the need to increase upper body strength training, particularly in post-treatment phases.

### 7.1.3 Fatigue

The Active Together service positively impacted patient fatigue levels, which is one of the most prevalent, distressing, and persistent side effects among cancer patients (49). Fatigue was measured by the FACIT-Fatigue (Functional Assessment of Chronic Illness Therapy – Fatigue Scale) questionnaire, which uses a scale of 0-52, with 52 indicating no fatigue and 0 being extremely fatigued. The median baseline value of Active Together patients was 39 for male and 38 for female patients. Healthy population norms range from 41 to 45 (50). Patients experienced reduced fatigue (+2.5 points compared to baseline) after prehabilitation, an increase in fatigue after treatment (-3.5 points compared to baseline), and an increase within the post-treatment recovery phases (+0.5 and +1.5 points compared to baseline), reflecting the overall benefits of the service in managing fatigue in cancer patients (Figure 5). For context, studies including patients with pulmonary disease and systemic sclerosis estimate that a change of 3-5 points is likely to be clinically relevant (51,52). This trend aligns with existing cancer literature, where fatigue is known to worsen after treatment but often improves with structured rehabilitation programmes (53). Without rehabilitation, a significant portion of patients experience long-term fatigue (54).

#### Aerobic Capacity

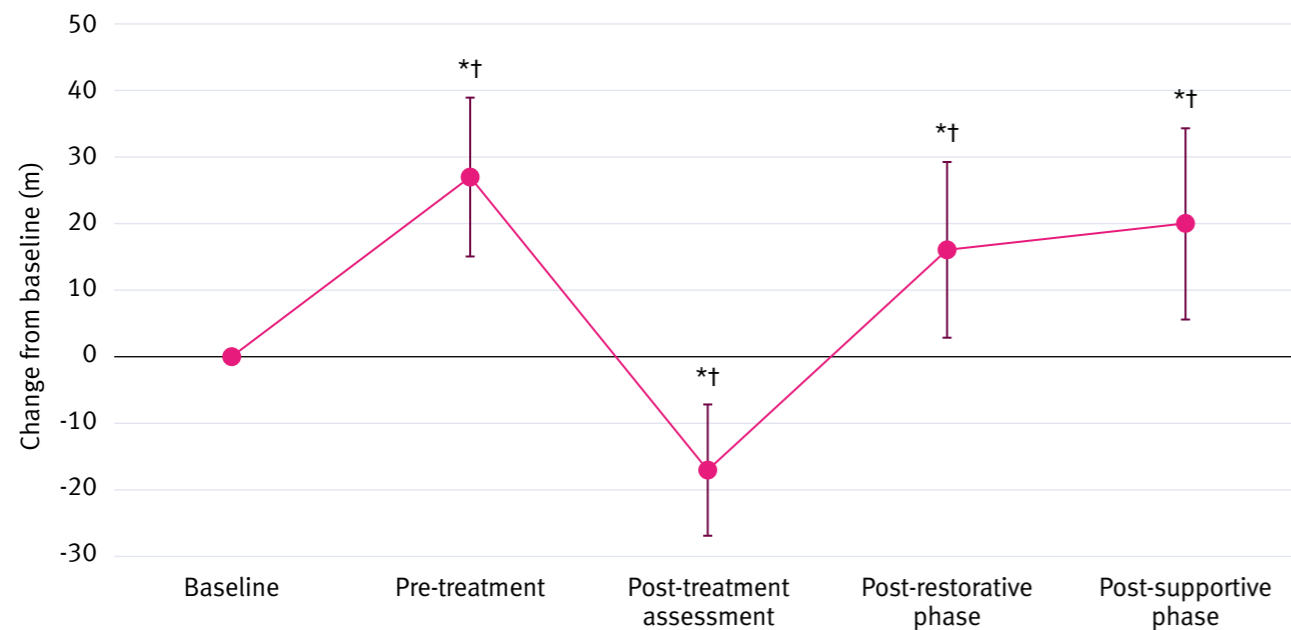


Figure 4. The median change from baseline in the distance walked in six minutes at each assessment, with 95% confidence intervals, for all Active Together patients. \* Indicates a significant difference from baseline, † indicates a significant difference from the previous assessment.

#### Fatigue

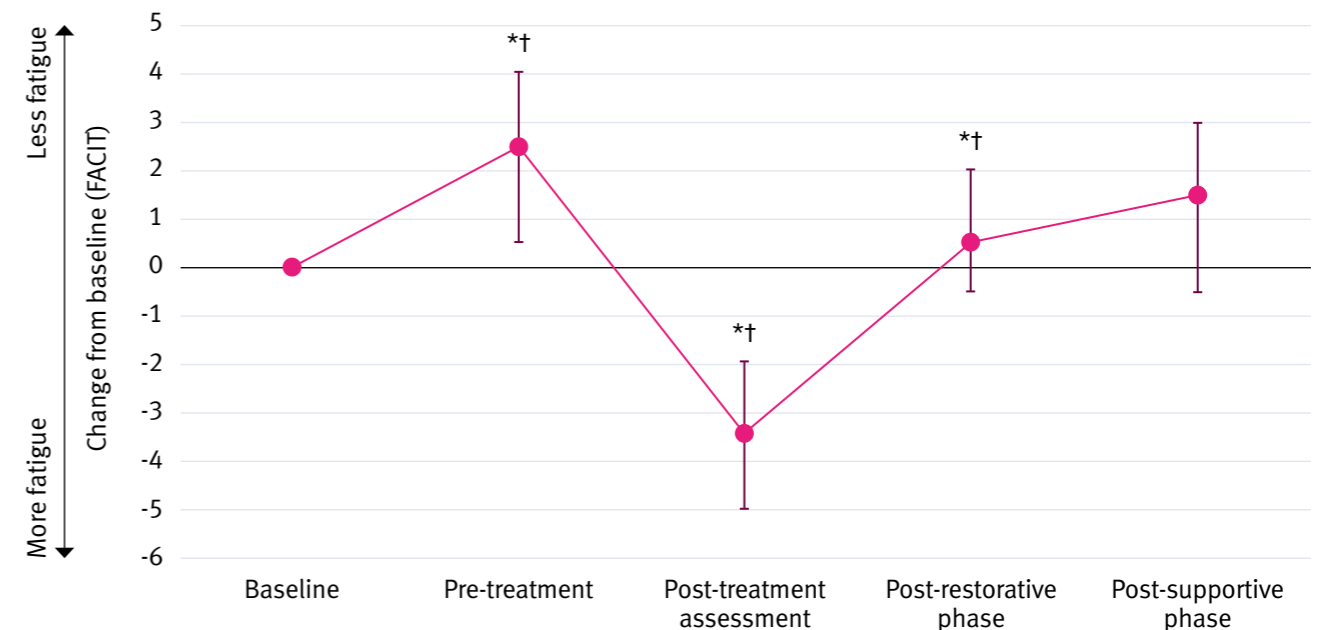


Figure 5. Median change from baseline in FACIT-Fatigue questionnaire score at each assessment, with 95% confidence intervals, for all Active Together patients. \* Indicates a significant difference from baseline, † indicates a significant difference from the previous assessment.

### 7.1.4 Physical Activity-Related Adverse Events

A high proportion of cancer patients have multiple co-morbid conditions, which cancer treatments can worsen. Patients attending prehabilitation often present with blood pressure outside normal ranges, with 57% of Active Together patients having hypertension (resting systolic blood pressure  $\geq 140$ mmHg and/or diastolic  $\geq 90$ mmHg) at their baseline assessment. Active Together resourced needs assessments with experienced physiotherapists for the initial review and after cancer treatment to identify and address potential risks. The service employed established safety protocols from cardiac rehabilitation (55), including periodic blood pressure and oxygen saturation monitoring. This proactive risk screening enabled the identification of contraindications before exercising, thereby minimising the risk of adverse events. Despite completing approximately 2000 physical assessments and overseeing 1680 patient episodes of exercise (40 patients per week for 18 months), only five adverse events related to the exercise intervention occurred. These included feeling light-headed or dizzy after exercise (n = 3), low blood pressure after exercise (n = 1), and one fall during exercise (n = 1). All incidents were reported and investigated through the Datix system and Sheffield Teaching Hospitals NHS Foundation Trust clinical governance standard procedure. This low incidence of adverse events demonstrates the safety of the Active Together programme, especially considering the high-risk nature of the cancer population.

It is important to note that over half of exercise oncology studies do not report adverse events, as highlighted in a review by Dunn and colleagues (55). This lack of reporting highlights the significance of Active Together's thorough monitoring and transparency regarding adverse events.

*“The dietitian there was fantastic...they’ve (healthcare professionals outside of Active Together) always told me I’ve got a fat tummy, and I should lose a bit of weight, but she (the Active Together Dietitian) said yes, but there’s good weight loss and there’s bad weight loss and you’re one has been bad weight loss because you just didn’t have the energy to prepare meals and eat. The way she explained it was really good, yeah. I felt better. I’ve eaten better. ... So yeah, I’m doing better.”*

*Female, aged 75, lung cancer*

## 7.2 Summary

### 7.2.1 What Went Well

- Significant improvement in 6MWT distance (+27m) and sit-to-stand performance ( $\geq 2$  repetitions) after prehabilitation. This shows that Active Together patients were fitter before treatment, giving them a better chance of tolerating surgery, spending less time in hospital, and recovering more quickly.
- Following treatment, 6MWT increased above baseline levels (+20m), as did sit-to-stand performance ( $\geq 2$  repetitions). This indicates that the service helped ameliorate the harmful effects of treatment and build physiological resilience that is likely to contribute to longer-term survival.
- Fatigue levels returned to baseline after rehabilitation.
- There was a very low incidence of adverse events related to physical activity.

### 7.2.2 Recommendations for the Future

- Strengthen interventions to preserve aerobic capacity post-treatment further and enhance long-term recovery. This could be achieved by encouraging a gradual progression to higher-intensity exercise after a moderate level of activity has been established.
- Increase strength training for patients during later rehabilitation phases (56). By incorporating targeted strength exercises, we can help patients improve their physical resilience and maintain a healthier body composition, enhancing their overall recovery and quality of life.
- Continue rigorous reporting and proactively address minor incidents to maintain safety.
- Monitor adherence to prescribed sessions as a key driver of improving engagement and outcomes.

## 7.3 What is the Impact of Active Together on Nutritional Status?

### 7.3.1 Dietetic Support Needs

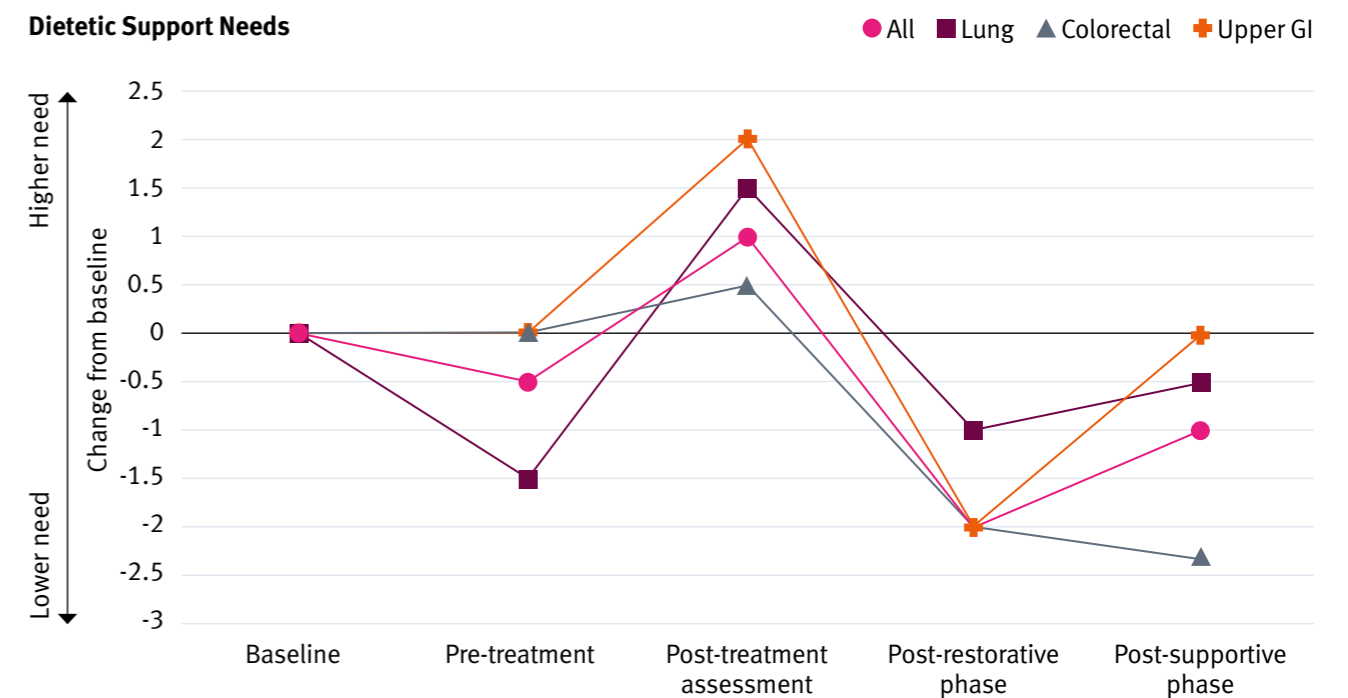
The short-form Patient-Generated Subjective Global Assessment (PG-SGA SF) was used to measure dietetic support needs, with a higher score indicating higher need (57). Upper GI patients had the highest nutritional needs post-treatment (Figure 6). Upper GI patients' baseline score was also notably higher (6.5 points) than the other groups (3.5 and 3 points for colorectal and lung patients, respectively). A score of 4 or above requires an intervention by a dietitian in conjunction with other clinicians, and a score of 2-3 is considered at risk of malnutrition (58).

The Active Together service provided dietetic support to patients, especially those with higher PG-SGA SF scores, aiming to prevent and treat malnutrition, help them manage the physical stress and side effects of treatment, improve their eating habits, and maintain healthier weight levels. This supported patients with greater nutritional risks to stabilise their condition and better tolerate treatment. This was highlighted through patient feedback, which spoke of the vital role of dietetic support.

*“I think the dietitian is vital... from four months before diagnosis, January, so about 18 months I’ve lost five stone... and I am still losing weight. The chemo and the surgery, they removed all of my stomach, I appreciate it’s very traumatic to the body, so it’s important that I focus on trying to get just that 10% more calories than I use up each day. So I think the dietitian, the help that they give me, is the most beneficial.”*

*Male, aged 70, upper GI cancer*

**Dietetic Support Needs**



*Figure 6. Median change from baseline in Short-form Patient-Generated Subjective Global Assessment for all patients, and each tumour group.*

### 7.3.2 Body Composition

The median body mass index (BMI) measured at baseline was 27.7 kg/m<sup>2</sup> for male and 29.8 kg/m<sup>2</sup> for female patients, which is categorised as overweight. However, BMI >25 kg/m<sup>2</sup> has been shown to be associated with improved survival rates in cancer patients (59). In colorectal and lung patients, BMI declined marginally (0.7-1 kg/m<sup>2</sup>) after treatment and gradually returned to baseline. In contrast, the upper GI group saw a significant and sustained reduction in BMI (-3 kg/m<sup>2</sup>) (Figure 7), highlighting their higher risk of nutritional depletion during treatment. Many upper GI patients suffer from symptoms such as difficulty swallowing and early satiety for years after surgery (60). Therefore, preventing further weight loss in the months after treatment is a positive outcome as patients adjust to their new requirements.

Some patients were advised by their surgeons to lose weight before their surgery. There is limited evidence on whether pre-surgery weight loss improves patient outcomes. The Active Together dietetics service rarely recommended weight loss for patients, encouraging most patients to focus on body composition changes and emphasising eating well rather than any main food group restrictions.

Patients who were recommended weight loss reported that Active Together had helped them safely meet the requirements to proceed with treatment.

**“Well, I was weighed at the hospital, and I’d lost over a stone. And they said a lot of people they give the advice to take no notice, and I think losing the weight actually helped me get the operation.”**

*Male, aged 77, colorectal cancer*

Waist-to-hip ratio measurements provided additional insights into body composition changes. Baseline values were 0.96 (obese) and 0.84 (borderline obese) for male and female patients, respectively (61). After treatment waist-to-hip ratio decreased but increased again following rehabilitation to significantly above baseline (+0.015). There were significant differences between the tumour groups, with upper GI patients experiencing a notably larger decrease in waist-to-hip ratio post-treatment. This significant difference persisted at the post-supportive assessment (Figure 8). During rehabilitation, the waist-to-hip ratio for lung and colorectal patients increased, alongside an increasing body-mass index, back to a baseline level. The main focus of the dietetics support is to ensure adequate energy and protein intake (62), which should result in positive body composition changes alongside physical activity. There are limitations to

using waist-to-hip ratio and BMI as measurements to accurately distinguish between fat and muscle mass changes (63). Future evaluations may wish to address this.

## 7.4 Summary

### 7.4.1 What Went Well

- The service effectively identified patients with significant body composition changes and high nutritional needs, which enabled the provision of more targeted and specialist dietetic support.
- Dietetic support within the service was critical in helping patients manage undernourishment and maintain energy levels during treatment, particularly for upper GI patients.

### 7.4.2 Recommendations for the Future

- The short-form Patient-Generated Subjective Global Assessment (PG-SGA SF) scores highlighted that upper GI patients had the highest dietetics support needs. This finding underscores the importance of providing targeted dietetics interventions for these patients to optimise their health outcomes and support their recovery more effectively.
- Use more sophisticated body composition measures, such as bioelectrical impedance analysis, alongside routine body composition and nutritional status monitoring. This will allow for a nuanced understanding of fat and muscle mass changes and inform the design of patient interventions.
- Further evidence is needed to understand whether it is appropriate and safe to recommend weight loss for patients classified as overweight or obese. A specific subgroup analysis of patients who lose weight would be valuable in determining if weight loss leads to better patient outcomes.
- Case studies of patients with exceptionally high nutritional needs would also be beneficial to understanding the complex nature of recovery from upper GI surgery and the effect of Active Together on their recovery.

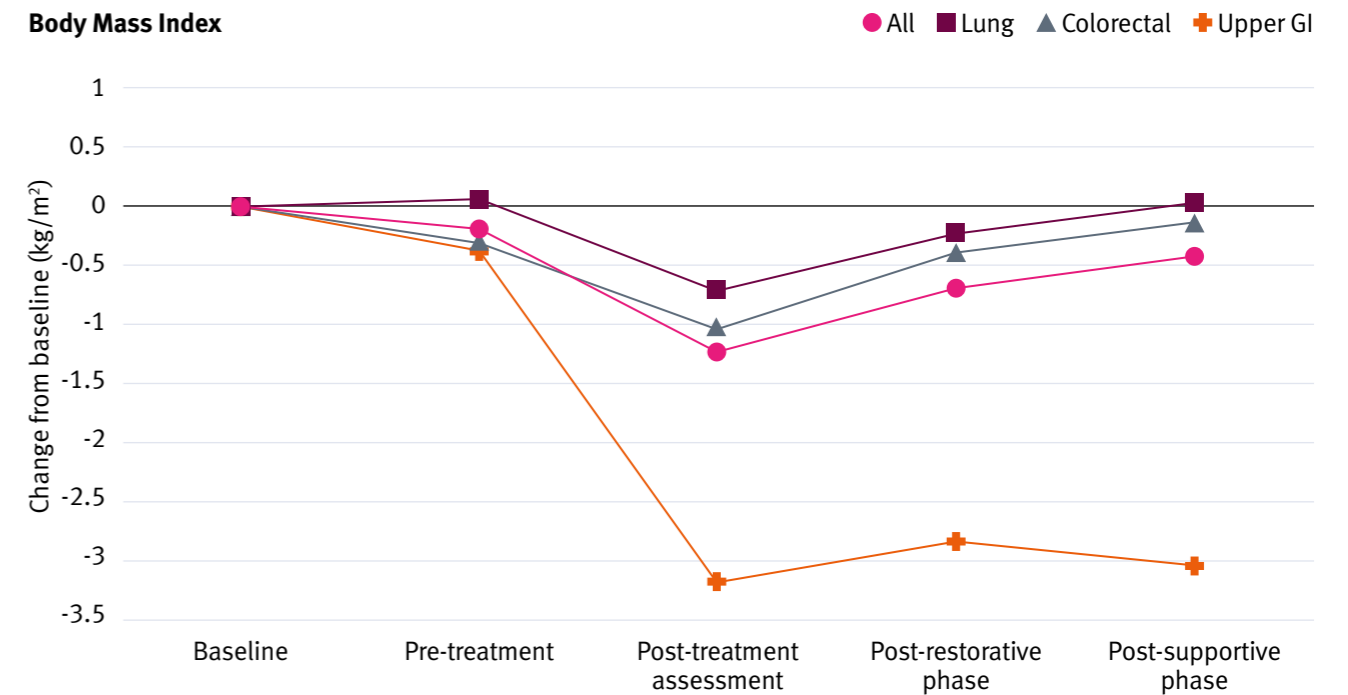


Figure 7. Median change from baseline in body mass index for all patients, and each tumour group.



Figure 8. Median change from baseline in waist-to-hip ratio for all patients and each tumour group.

## 7.5 What is the Impact of Active Together on Physical Activity Behaviour?

### 7.5.1 Physical Activity Levels

Patients attending the Active Together service increased their physical activity levels during the prehabilitation phase. A decline was then observed during treatment. This is the expected pattern of behaviour for this population. Encouragingly, activity levels returned to baseline during the restorative phase and increased during the supportive phase. This is a strength of the intervention and suggests that patients had navigated the treatment decline successfully and were building positive patterns of behaviour that would contribute to positive, longer-term outcomes (Figure 9).

Physical activity behaviour was assessed by the Exercise Vital Signs (EVS) score, which asks for the “average number of days engaging in moderate to strenuous exercise” and the “average number of minutes engaged in exercise at this level”. The median baseline value was 170 min/week (190 min/week for male and 150 min/week for female patients). These values are lower than those of a previous study, which found that upper GI patients reported an average value of 268 min/week (29) but above the recommended value of 150 min/week (64). The well-documented weaknesses of self-report questionnaires could explain the high baseline physical activity level (65). Patients may have overestimated the amount of moderate to strenuous exercise completed, but as changes from baseline are used, the pattern of change remains useful.

Patients attending the Active Together service increased their physical activity levels during the prehabilitation phase.

### 7.5.2 Self-efficacy for Exercise

Self-efficacy for exercise, assessed using the Self-Efficacy for Exercise (SEE) questionnaire and patient interview data, provided insights into patients’ confidence in maintaining exercise routines independently. At baseline, patients showed moderate confidence in their ability to exercise (with a median scores of 53 and 57 out of 90 for male and female patients, respectively, where higher scores indicate a greater likelihood of exercising). There was a median increase of 7 points after the prehabilitation period. However, following treatment, scores decreased, with subsequent assessments showing no significant difference from the baseline (Figure 10).

Patient interviews echoed these findings, with many expressing concerns about their ability to maintain exercise routines once their participation in the service ended.

**“I’m going to do my very best to do it. I mean I’ve got the exercises at home. I can carry on at home. Unfortunately, like in most aspects, life gets in the way at home, you know...It’s easier to say well I’ll do that later, I’ll do the exercises later, and then it doesn’t happen. But I’m going to try and make the effort to carry on at home, you know, when my time at Active Together comes to an end.”**

*Male, aged 67, colorectal cancer*

This sentiment highlights the challenge of sustaining long-term behaviour change once Active Together’s structured, supportive environment is no longer available. Patients not only valued the exercise programme but also formed an emotional attachment.

**“I finished the time I was allowed. I was really sad, actually. I didn’t want to stop going.”**

*Female, aged 75, lung cancer*

### Physical Activity Level

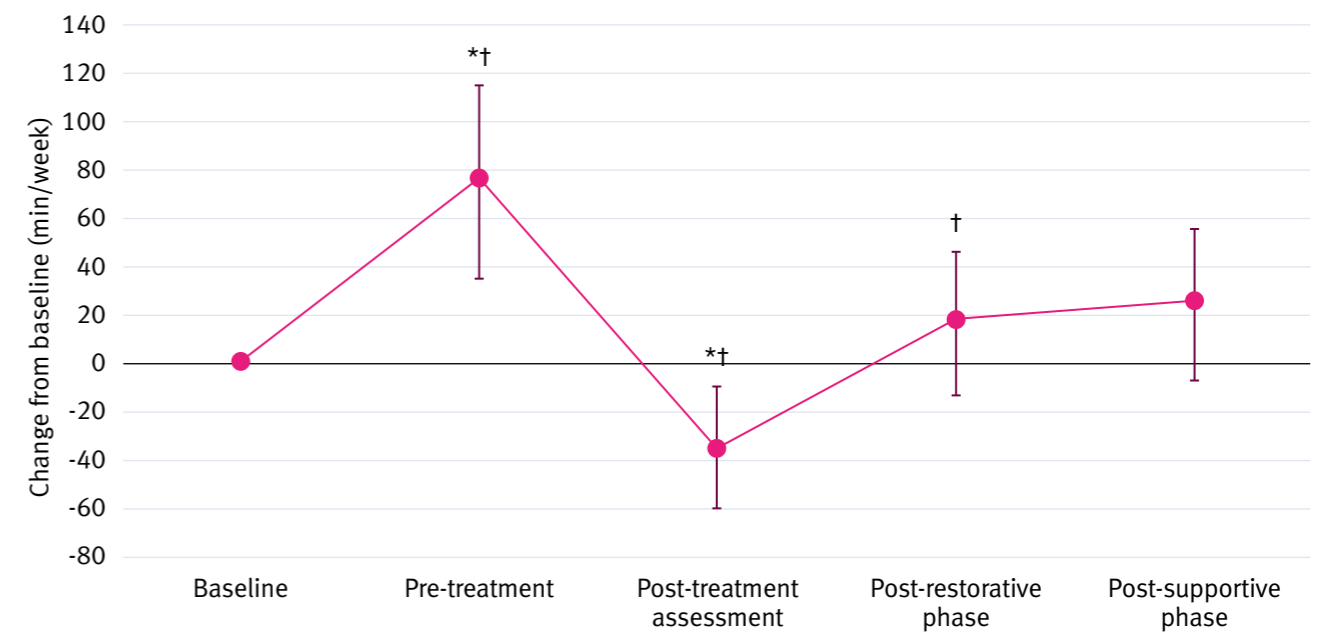


Figure 9. Median change from baseline in self-reported physical activity (Exercise Vital Signs score) at each assessment, with 95% confidence intervals, for all Active Together patients. \* Indicates a significant difference from baseline, † indicates a significant difference from the previous assessment.

### Self-Efficacy for Exercise

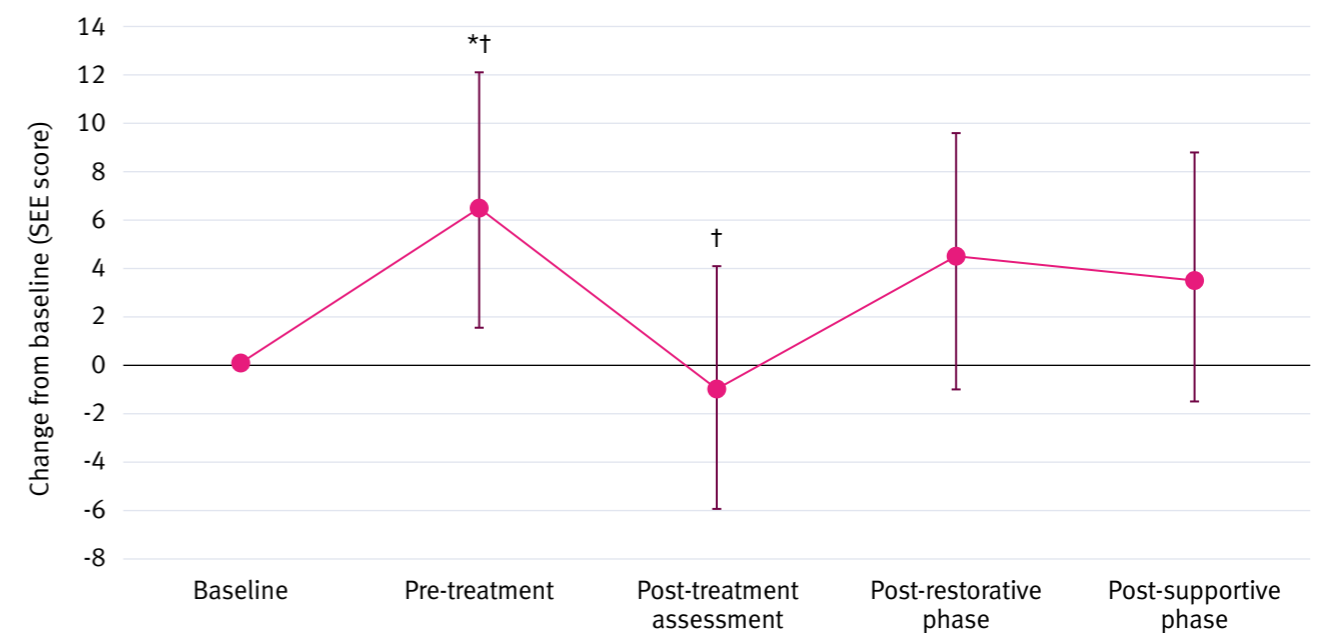


Figure 10. Median change from baseline in Self-Efficacy for Exercise score at each assessment, with 95% confidence intervals, for all Active Together patients. \* Indicates a significant difference from baseline, † indicates a significant difference from the previous assessment.

A strength of the Active Together service is the application of tailored behaviour change techniques and person-centred care across the cancer rehabilitation pathway. Behaviour change techniques included but were not limited to: education on the benefits of regular exercise, dietetics, and psychological well-being, feedback on positive health behaviours, clear demonstrations of activities, and instructions on performing new behaviours effectively to equip patients with the necessary skills and knowledge. Goal setting and action planning were also incorporated to help patients achieve and maintain their personal health goals. While Active Together successfully fostered a supportive environment that encouraged regular exercise during the programme, the evaluation findings highlight that more can be done to empower patients to maintain healthy habits independently in the long term. The service is based on a person-centred approach, emphasising autonomy and long-term self-management. However, some patients do not have the planning and coping skills to sustain their behaviours once they exit the programme. Finding ways to reduce the level of support provided to patients in a tapered way might help promote autonomy and prepare patients to exit the service. However, implementing behaviour change strategies into usual care is complex, time-consuming, and uncommon. This is especially the case with patients with complex clinical needs and low confidence who value the support of a health professional.

## 7.6 Summary

### 7.6.1 What Went Well

- Participants increased their physical activity during the prehabilitation phase and successfully managed the known decline post-treatment, with evidence suggesting activity levels were above baseline levels upon exiting the programme.
- Patients reported positive experiences with the structured support provided, highlighting its importance in maintaining motivation and creating a supportive environment.
- The Active Together team used person-centred care and tailored behaviour change techniques across the cancer rehabilitation pathway.

### 7.6.2 Recommendations for the Future

- Develop strategies and tools to support patients in maintaining exercise routines independently post-programme, such as personalised follow-up plans and digital resources tailored to each patient's self-efficacy level.
- Focus on training staff in advanced behaviour change techniques to enhance their ability to support patients transitioning from structured guidance to long-term self-management.
- Foster greater patient autonomy by integrating strategies that empower patients to take control of their physical activity while ensuring continuous support.
- Enhance existing training for staff to ensure patients are equipped with the tools and confidence needed to continue their exercise routines beyond the programme. There is also an opportunity to review the extent to which these techniques are delivered consistently across the different phases of cancer treatment and where emphasis on planning and coping skills could be enhanced.

## 7.7 What is the Impact of Active Together on Psychological Wellbeing?

### 7.7.1 Health-Related Quality of Life

The EQ-5D-5L measures health-related quality of life (HRQoL) across five domains, with one question per domain: mobility, self-care, usual activities, pain/discomfort and anxiety/depression (66). These measures were combined into a single index with a maximum score of 1 (full health) and values below 0 (worst health possible). The median baseline value was 0.77 for male and 0.74 for female patients, which is representative of cancer populations adopting this method of assessing HRQoL (67). HRQoL did not

improve during prehabilitation and decreased after treatment. Health-related quality of life improved during rehabilitation but did not return to baseline levels (Figure 11). Only the post-treatment decline and subsequent increase in EQ-5D-5L score reached the clinically important threshold of 0.06 relevant to cancer populations (68).

A strength of the Active Together service is the application of tailored behaviour change techniques and person-centred care across the cancer rehabilitation pathway.

#### Health-Related Quality of Life (EQ-5D Index)

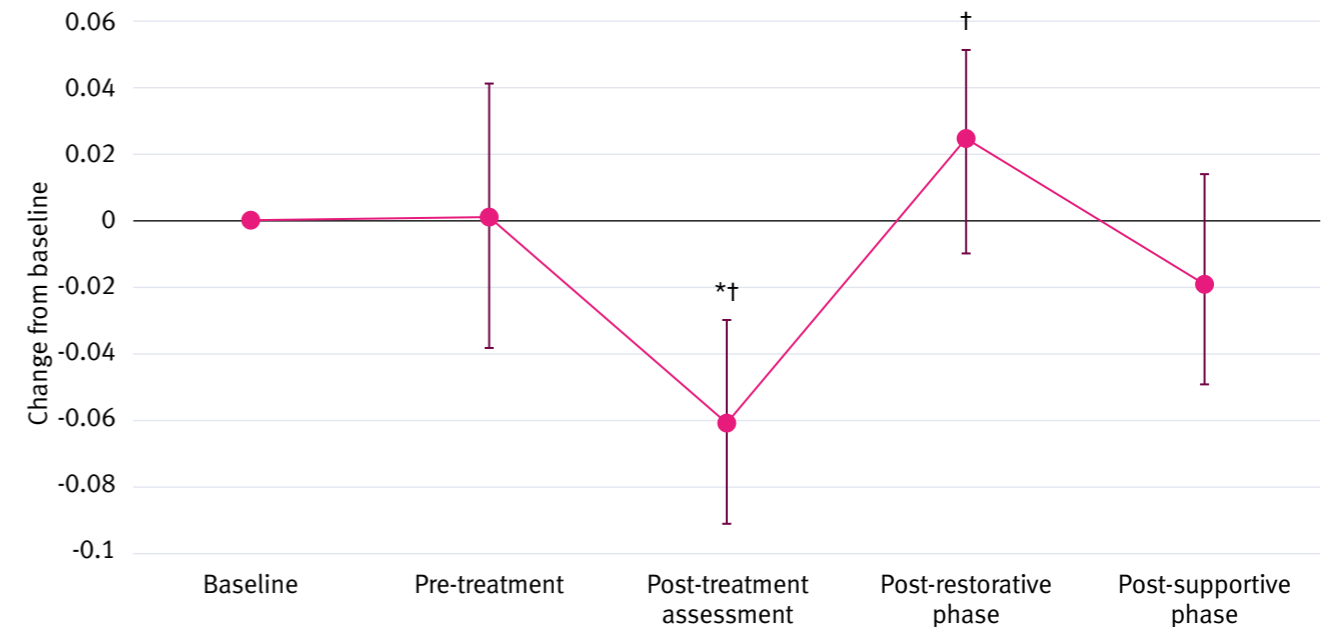
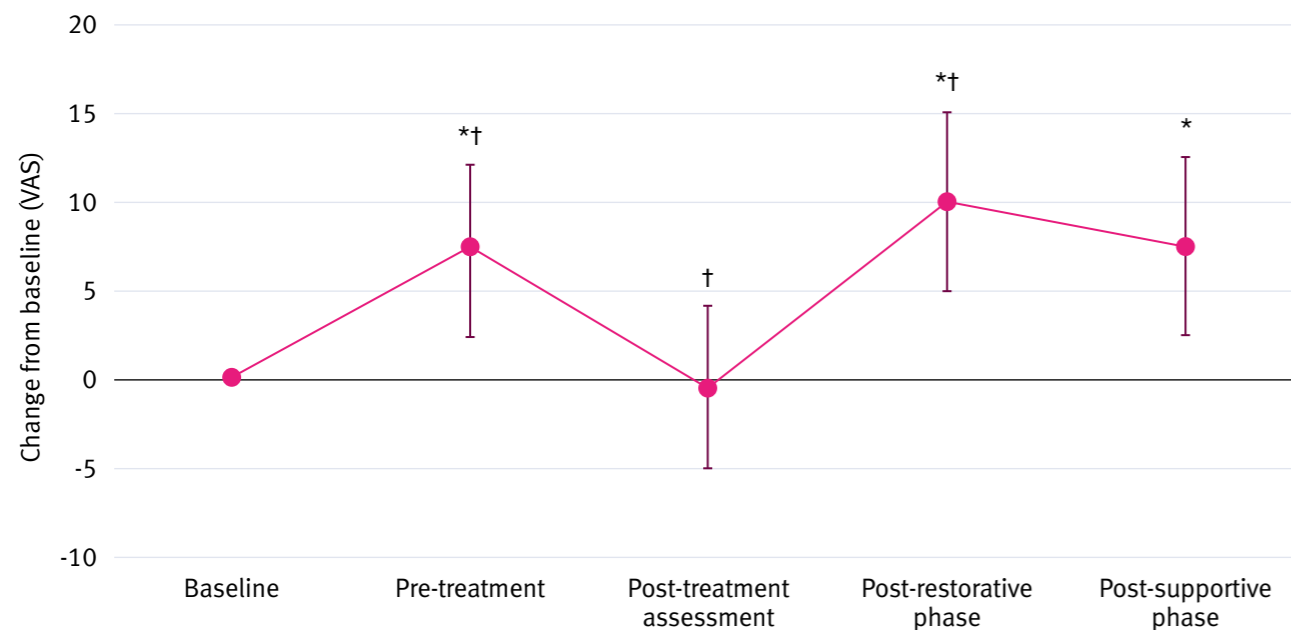


Figure 11. Median change from baseline in EQ-5D Index at each assessment, with 95% confidence intervals, for all Active Together patients. \* Indicates a significant difference from baseline, † indicates a significant difference from the previous assessment.

### Health-Related Quality of Life (EQ-5D Visual Analogue Scale)



**Figure 12.** Median change from baseline for the EQ-5D Visual Analogue Scale at each assessment, with 95% confidence intervals, for all Active Together patients. \* Indicates a significant difference from baseline, † indicates a significant difference from the previous assessment.

The EQ-5D also includes a visual analogue scale (VAS), where individuals rate their current overall health on a scale ranging from 0 to 100. The minimum clinically important difference is 7 points on the VAS (68). The median baseline value was 65 for male and female patients, which improved by 7.5 points (a clinically important difference) after prehabilitation. The VAS score declined to baseline after treatment and then increased by a clinically relevant amount after the restorative (+10 points) and supportive phases (+7.5 points) (Figure 12).

It is important to recognise that the impact of cancer on an individual extends far beyond the conclusion of primary treatment. The long-term effects of cancer and its treatment are well documented, including persistent physical symptoms and psychosocial challenges (69). Despite comprehensive care, many survivors will continue to experience a reduced quality of life compared to those without a history of cancer

(70). Therefore, the evidence suggesting that the Active Together service has helped patients maintain a reasonable quality of life should be considered favourable.

**“I do everything, I’m driving more, I do all my own housework, all my own shopping. I was getting to the state where I was really struggling with quite a few jobs really, bending and things like that, whereas I’m doing much better now physically.”**

*Female, aged 75, lung cancer*

Despite comprehensive care, many survivors will continue to experience a reduced quality of life compared to those without a history of cancer. Therefore, the evidence suggesting that the Active Together service has helped patients maintain a reasonable quality of life should be considered favourable.

### 7.7.2 Anxiety

Patients valued the psychological support provided by the service. They emphasised a beneficial impact on their mental health, which enabled them to cope well with treatment and respond positively during the post-treatment period.

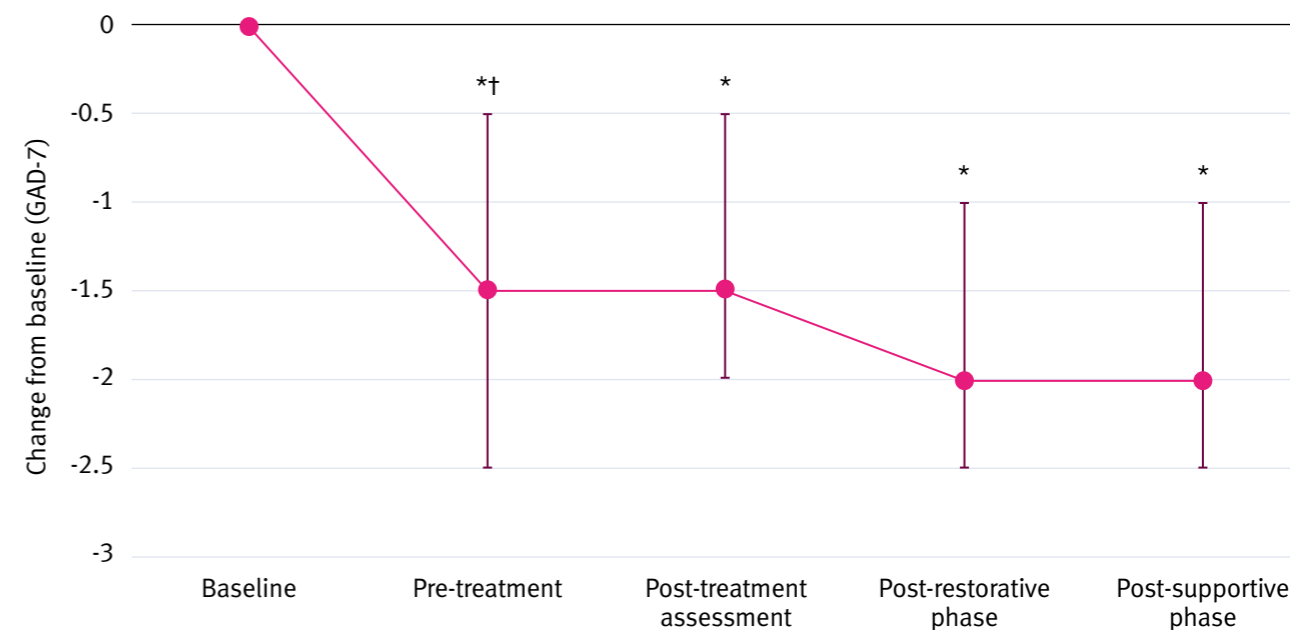
**“It gave me the confidence to get my physical health back to what it was pre-cancer treatment which in turn helped my mental health and my life in general is better- thanks to all involved.”**

*Female, aged 75, colorectal cancer*

The results from the GAD-7 questionnaire also support the positive impact of psychological support provided. The GAD-7 is a measure of anxiety symptom severity, with higher values indicating a higher severity of anxiety symptoms on a scale of 0 to 21. The minimum clinically important difference for GAD-7 in cancer is unknown. A large observational study of patients’ chronic pain and comorbid depression/anxiety estimated that 3 points is a clinically relevant change (71). The median baseline value for Active Together patients was 5.5 (5 for male and 6 for female patients), which is just above the cut-off for mild anxiety (72). Anxiety decreased below baseline at all assessment time points by -1.5 to -2 points (Figure 13). Overall, patients showed a marked improvement, progressing from a state of mild anxiety to experiencing minimal anxiety.



### Anxiety



**Figure 13.** Median change from baseline in Anxiety symptoms (GAD-7) score at each assessment, with 95% confidence intervals, for all Active Together patients. \* Indicates a significant difference from baseline, † indicates a significant difference from the previous assessment.



The fact that symptoms of anxiety and depression both declined in Active Together patients underlines the value of including psychological support as part of rehabilitation services.

### 7.7.3 Depression

Depression severity was measured using the PHQ-9 questionnaire, which ranges from 0 to 27, with lower scores indicating lower severity and fewer depression symptoms (73). The minimum clinically important difference for PHQ-9 in cancer has not been established. However, a large observational study of older people (mean age 71 years) with depression estimated that a change of 5 points is a clinically relevant difference (74). Symptoms of depression increased after treatment (but only to 0.5 above baseline) but reduced following the restorative phase (Figure 14).

There were significant differences between male and female patients in the changes from baseline to post-treatment and baseline to post-supportive phase, with female patients more likely to experience a reduction in symptoms of depression (Figure 14). This contrasts with previous research showing that female cancer patients were more likely to have depression (75). There were no differences in the baseline value between sexes (6 for both male and female patients).

Taken collectively, the psychological outcomes from Active Together are particularly encouraging, considering evidence to suggest that symptoms of anxiety and depression can sometimes be delayed in patients until after treatment (76). Post-treatment is often the time when patients meaningfully consider the significance of the cancer diagnosis and the impact of the long-term lifestyle adjustments that result from treatment. At this point, depression and/or anxiety can emerge or increase. The fact that symptoms of anxiety and depression both declined in Active Together patients underlines the value of including psychological support as part of rehabilitation services. However, patient data from evaluation interviews suggests that leaving the Active Together service can result in a sudden loss of regular support for some patients. Therefore, future iterations of the service must work hard to mitigate any feelings of abandonment so that levels of anxiety and depression symptoms remain low for the long term.

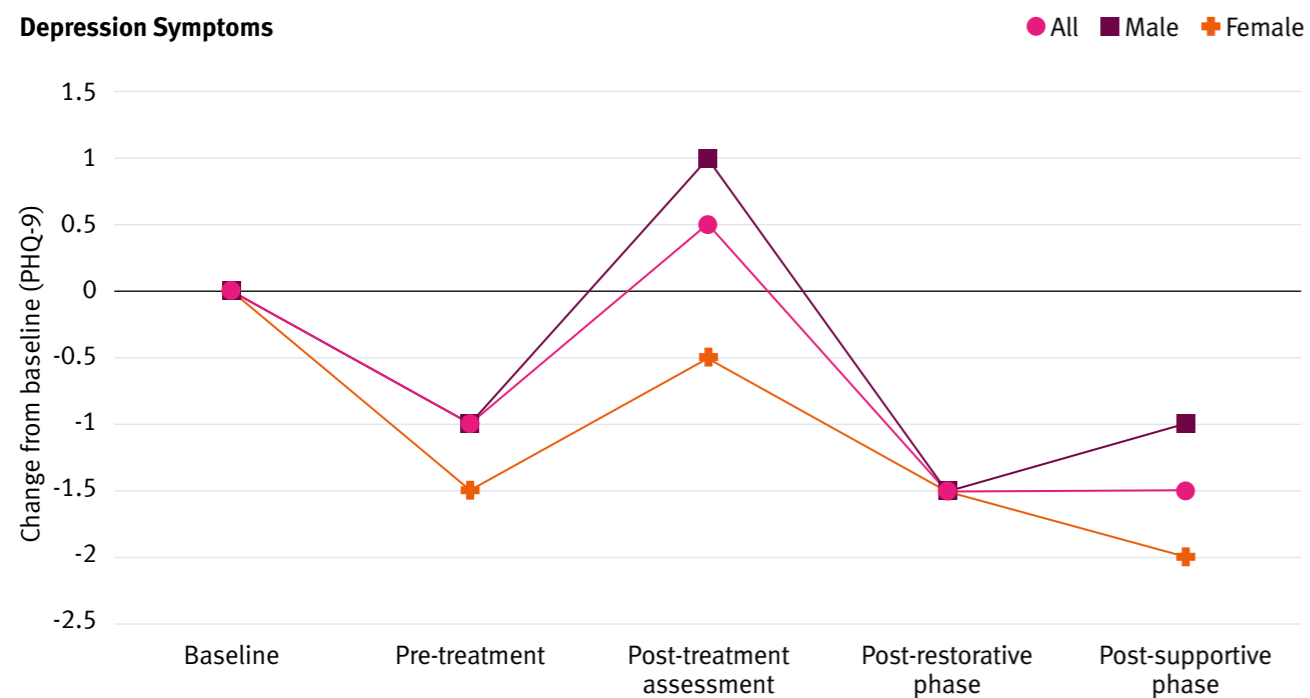


Figure 14. Median change from baseline in depression symptoms (PHQ-9) at each assessment for male, female, and all Active Together patients.

## 7.8 Summary

### 7.8.1 What Went Well

- Psychological support played an important role in reducing anxiety symptoms, with GAD-7 scores consistently dropping below baseline, demonstrating the programme’s effectiveness in addressing mental health.
- Female patients experienced a significant reduction in symptoms of low mood and depression following the restorative phase, contributing to improved mental wellbeing.

### 7.8.2 Recommendations for the Future

- Explore strategies to sustain long-term improvements in quality of life post-rehabilitation, ensuring patients maintain gains beyond the programme.
- Investigate why female patients showed greater improvement than male patients and develop targeted interventions to support different genders equally in reducing depression symptoms.
- Explore the impact of Active Together on patients returning to work.



## Peter’s Experience

“Active Together has made a big impact on my life. The programme helped me recover tremendously from my cancer treatment and I’m now more active. I feel more like myself than before.”

“I was quite anxious and apprehensive before going to Active Together for the first time, but as soon as I arrived everyone was so helpful and kind. They really put me at ease.”

“Active Together helped me overcome my fatigue. When I was going through treatment, I was very tired, and I’d lost a lot of weight. They designed a programme to help me get back to where I was, to help with the fatigue and build up my strength. I’ve got a lot more energy now because of it.

“They tailored everything to me, and I really enjoyed the activities, I was walking on the treadmill and using the cycling machine as well as doing weight exercises. I found the exercises gave me more energy, more zest for life, and they just kept me going. I’m really feeling the benefits.”

# 8

# The Impact of Active Together on Healthcare Resource Use

## 8.1 What is the Impact of Active Together on Hospital Length of Stay?

Healthcare resource use was examined using three measures: 1) the length of stay in hospital after surgery, 2) the length of stay in critical care after surgery, and 3) the total number of days spent in hospital after an emergency readmission in the 90 days following surgery. Active Together patients were compared to patients who declined to join the service and were matched to historical controls based on their procedure type and whether their tumour was determined to be malignant (n = 282) or benign (n = 23). Data was not available to match by stage and progression of disease, but all patients were undergoing treatment with curative intent. A list of included hospital procedures can be found in Appendix 6. Outliers were excluded based on their length of stay being over 3.29 standard deviations away from the mean historical value (>44 days) (77). The sample sizes and average age for each group are shown in Table 1.

Using declined and historical patients as comparators means there is not a true ‘control’ group, as the data could be affected by other factors, such as Covid-19 affecting length of stay pre- and post-pandemic for the historical group or differences relating to capacity.

Additionally, the sample size of the declined group was too small to be matched for procedure or tumour type (malignant or non-malignant), which relates to cancer severity. An effect of age was investigated; however, there was no significant correlation between age and length of stay (p value = 0.927, rho = 0.003).

**Table 1. Sample sizes for healthcare resource use and survival comparisons.**

Tumour Group	Number of Patients			Age on Admission (mean ± standard deviation)		
	Active Together	Declined	Historical	Active Together	Declined	Historical
Colorectal	162	31	463	69 ± 10	68 ± 10	67 ± 11
Lung	81	51	243	68 ± 9	71 ± 8	70 ± 9
Upper GI	62	14	163	65 ± 10	67 ± 8	65 ± 10
Total	305	96	869	68 ± 10	70 ± 9	67 ± 10

“We’ve probably got one of the shortest lengths of stays in the country and so we didn’t expect Active Together to actually improve that because when you’re already in the top 5% for reduced lengths of stays, with the number of patients that we operate it can only be hard to move on that further. But what we would hope is that patients are better able to deal with complications...not be reliant on healthcare professionals to do all the work for them.”

*Consultant Surgeon (upper GI),  
Sheffield Teaching Hospitals*



There were meaningful improvements (effect size >0.2 [78]) in length of stay for Upper GI Active Together patients compared to the declined and historical groups, with 0.23 and 1.61 days longer stay for declined and historical patients, respectively. Similarly, declined and historical Upper GI patients spent 0.54 and 0.40 days longer in critical care than Active Together patients. These differences were clinically meaningful but not statistically significant (Tables 2 and 3).

For colorectal patients, the historical group spent significantly longer in critical care (0.32 days) than the Active Together patients. Declined patients spent 0.39 days longer in critical care, although this difference did not reach statistical significance. Conversely, historical lung patients spent significantly less time in critical care than Active Together patients (-0.75 days), although declined patients spent 0.53 days

longer. This may be because Active Together improved the chances of complex patients accessing surgery. In contrast to Active Together, previous prehabilitation studies have often excluded complex patients, such as those not yet offered surgery or with certain comorbidities (28,79,80). There were no significant differences between groups in the total number of days spent in the hospital after an emergency readmission in the 90 days following surgery (Table 4). However, historical colorectal patients spent 0.94 more days in hospital than Active Together patients (effect size = 0.22).

**Table 2. Length of stay in hospital after surgery for Active Together (AT), declined and historical patients.**

Tumour Group	Mean (95% CI)			Mean difference to AT† (95% CI)		P value (Effect size)	
	AT	Declined	Historical	Declined	Historical	Declined	Historical
Colorectal	7.73 (6.96 – 8.53)	9.48 (6.42 – 12.81)	8.16 (7.53 – 8.79)	1.76 (-1.68 – 5.2)	0.43 (-0.61 – 1.47)	0.810 (0.04)	0.810 (0.07)
Lung	6.21 (5.44 – 7.07)	7.27 (5.82 – 9.04)	5.82 (5.39 – 6.35)	1.06 (-0.84 – 2.97)	-0.39 (-1.34 – 0.56)	0.947 (0.02)	0.408 (0.16)
Upper GI	9.48 (8.35 – 10.86)	9.71 (8.07 – 11.57)	11.1 (10.13 – 12.25)	0.23 (-2.18 – 2.64)	1.61 (-0.09 – 3.32)	0.282 (0.28)	0.106 (0.31)
Total	7.68 (7.13 – 8.25)	8.34 (7.07 – 9.75)	8.06 (7.65 – 8.46)	0.66 (-0.87 – 2.19)	0.38 (-0.34 – 1.09)	0.778 (0.03)	0.733 (0.06)

\* Statistically significant; AT = Active Together; † A positive value indicates a longer stay compared to Active Together patients.



**“One patient was initially declined for thoracic surgery based on fitness and lung function. He was then accepted after a period of prehab with Active Together.”**

*Consultant Surgeon (upper GI), Sheffield Teaching Hospitals*

**Table 3. Length of stay in critical care after surgery for Active Together (AT), declined and historical patients.**

Tumour Group	Mean (95% CI)			Mean difference to AT† (95% CI)		P value (Effect size)	
	AT	Declined	Historical	Declined	Historical	Declined	Historical
Colorectal	0.86 (0.61 – 1.15)	1.26 (0.55 – 2.03)	1.18 (1.03 – 1.37)	0.39 (-0.46 – 1.25)	0.32 (0 – 0.64)	0.507 (0.10)	0.011* (0.26)
Lung	2.49 (2.15 – 2.86)	3.02 (2.02 – 4.27)	1.74 (1.46 – 2.05)	0.53 (-0.76 – 1.81)	-0.75 (-1.25 – -0.26)	0.300 (0.23)	<0.0005* (0.61)
Upper GI	5.53 (4.77 – 6.55)	6.07 (4.57 – 7.64)	5.93 (5.47 – 6.47)	0.54 (-1.4 – 2.48)	0.40 (-0.61 – 1.41)	0.356 (0.24)	0.356 (0.20)
Total	2.25 (1.94 – 2.56)	2.9 (2.17 – 3.73)	2.23 (2.03 – 2.43)	0.65 (-0.2 – 1.5)	-0.02 (-0.39 – 0.36)	0.376 (0.15)	0.664 (0.03)

\* Statistically significant; AT = Active Together; † A positive value indicates a longer critical care stay compared to Active Together patients.

**Table 4. Total days in hospital after readmission as an emergency, in the 90 days post-surgery for Active Together (AT), declined and historical patients.**

Tumour Group	Mean (95% CI)			Mean difference to AT† (95% CI)		P value (Effect size)	
	AT	Declined	Historical	Declined	Historical	Declined	Historical
Colorectal	0.87 (0.43 – 1.46)	0.58 (0.00 – 1.48)	1.23 (0.83 – 1.72)	-0.30 (-1.30 – 0.71)	0.36 (-0.32 – 1.03)	0.607 (0.09)	0.545 (0.11)
Lung	1.89 (0.62 – 3.63)	0.76 (0.29 – 1.35)	0.86 (0.49 – 1.28)	-1.14 (-2.71 – 0.44)	-1.04 (-2.56 – 0.49)	0.747 (0.08)	0.587 (0.14)
Upper GI	0.79 (0.12 – 1.83)	2.36 (0.00 – 6.71)	1.73 (0.77 – 3.04)	1.56 (-2.84 – 5.97)	0.94 (-0.55 – 2.42)	0.571 (0.16)	0.42 (0.22)
Total	1.14 (0.68 – 1.7)	0.96 (0.36 – 1.84)	1.22 (0.92 – 1.54)	-0.18 (-1.08 – 0.71)	0.08 (-0.54 – 0.7)	0.88 (0.02)	0.841 (0.06)

\* Statistically significant; AT = Active Together; † A positive value indicates more days in hospital compared to Active Together patients.

## 8.2 What was the Cost of Delivering Active Together?

The cost per patient for the delivery of Active Together between March 2022 and May 2024 is £712.86 per referral. We calculated this by aggregating the cost of all delivery staff (salary and oncost), plus actual non-pay costs for premises and venue hire, equipment,

and materials (including patient goodie bags and staff uniforms), external staff training, staff, and patient travel and miscellaneous spend (postage, consumables). This total spend is then divided by the number of referrals per year.

## 8.3 What were the Cost-Saving Effects of Active Together on the Healthcare System?

The mean difference in hospital costs compared to the declined group was £1,079.22. This is similar to previous estimates of the financial benefit of prehabilitation for cancer patients (28). The cost of delivering the Active Together service is £712.86 per patient, resulting in an overall £366.36 saving per Active Together patient (Table 5). The declined group

are not a control group, so other factors may contribute to this cost saving. However, savings only include costs related to their stay in hospital post-surgery, and there are likely longer-term savings that were not captured directly, such as reduced primary healthcare costs, reduced social care costs, and earlier return to work.

**Table 5. The financial impact of Active Together on healthcare costs.**

Tumour group	Active Together hospital cost	Declined hospital cost	Mean difference	Overall cost saving per Active Together patient
Colorectal	£13,608.69	£14,581.99	£973.30	£200.44
Lung	£16,076.20	£17,282.86	£1,206.65	£493.79
Upper GI	£22,368.84	£23,558.34	£1,189.49	£476.93
Overall (weighted average)	£16,044.75	£17,123.97	£1,079.22	<b>£366.36</b>



## 8.4 What was the Impact of Active Together on Patient Survival?

Patients in the Active Together service had a lower risk of dying within one year after surgery compared to those who declined the service or were part of the historical data across all tumour groups (Table 6). The largest difference was found in upper GI patients who declined, who were 288% more likely to die in the first year than Active Together upper GI patients; however, there was only a sample size of 14. Overall, declined patients were 129% more likely to die compared to those in the Active Together service. Overall, female patients had a higher one-year survival rate (94%) than male patients (91%); there was no significant effect for sex on survival rate for any tumour group once Active Together participation had been taken into account. This evaluation does not have a true control group, as the reasons patients decline the service may

be due to their health. Some patients declined the service due to being too unwell (n = 9); however, far more declined because they were self-managing (n = 34). These results reflect previous studies, including randomised control trials, which show the beneficial effect of exercise interventions on cancer mortality (6,81).

The increased likelihood of Active Together patients being considered for surgery and other treatment, as well as their increased chances of survival, was strongly felt by both patients and professionals.

**Table 6. Survival rates and hazard ratios.**

Tumour Group	Statistic	Active Together	Declined	Historical
Colorectal	Sample Size	162	31	463
	1-Year Survival (95% CI)	97% (94% – 100%)	86% (72% – 100%)	95% (93% – 97%)
	Hazard Ratio (95% CI) <sup>†</sup>	1	3.49 (0.78 – 15.6)	2.15 (0.76 – 6.07)
	P value <sup>†</sup>		0.10	0.15
Lung	Sample Size	81	51	243
	1-Year Survival (95% CI)	93% (87% – 99%)	89% (80% – 99%)	90% (86% – 94%)
	Hazard Ratio (95% CI) <sup>†</sup>	1	1.32 (0.48 – 3.63)	1.13 (0.53 – 2.42)
	P value <sup>†</sup>		0.60	0.75
Upper GI	Sample Size	62	14	163
	1-Year Survival (95% CI)	91% (83% – 100%)	68% (45% – 100%)	85% (80% – 91%)
	Hazard Ratio (95% CI) <sup>†</sup>	1	3.88 (1.39 – 10.8)	1.31 (0.61 – 2.83)
	P value <sup>†</sup>		0.010*	0.49
Total	Sample Size	305	96	869
	1-Year Survival (95% CI)	95% (92% – 98%)	85% (77% – 93%)	92% (90% – 94%)
	Hazard Ratio (95% CI) <sup>†</sup>	1	2.29 (1.19 – 4.40)	1.43 (0.89 – 2.30)
	P value <sup>†</sup>		0.013*	0.14

\* Statistically significant; 95% CI = 95% Confidence Interval; † Compared to Active Together patients.

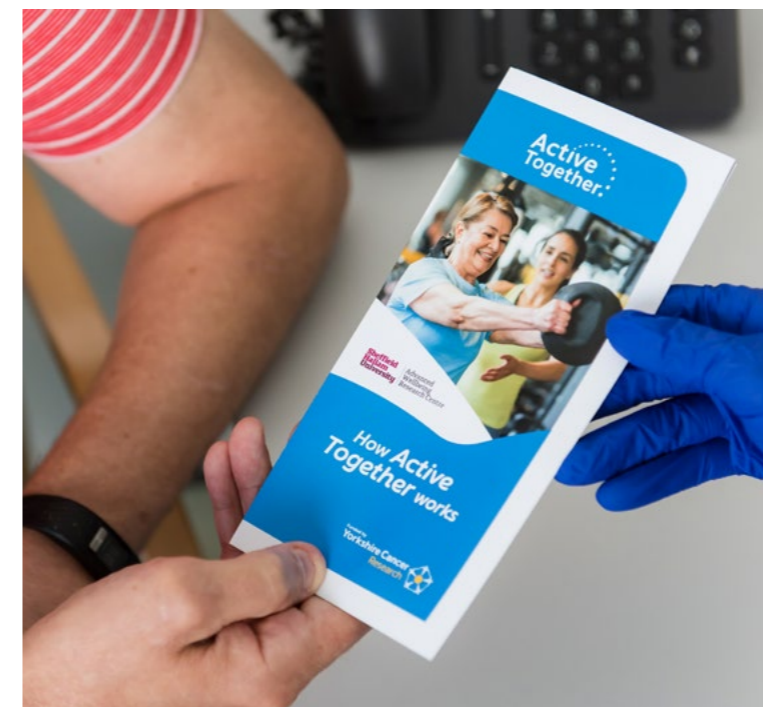
**“Without Active Together I wouldn’t be alive.”**

*Male, aged 70, upper GI cancer*

**“What Active Together does is supports the patients on a regular basis in a way that we don’t have that service in any other form. It’s patient centred and it’s just about making them the best they can be before surgery or giving the best chance of even getting the chance of surgery, which otherwise they wouldn’t have surgery.”**

*Consultant Anaesthetist, Sheffield Teaching Hospitals*

This data suggests Active Together has made a meaningful impact on survival and healthcare resource use at the current juncture. As the service and system mature, evidence suggests these impacts will increase, not shrink. Research shows that interventions that consider the complex interactions between an intervention and the wider system (including healthcare) often require significant time to implement and evaluate (82). Interventions considering the wider system may have delayed benefits, and initial improvements may not be as significant. This is why the data suggesting the service has demonstrated benefits in terms of 1-year survival is encouraging. Especially considering that the benefits of a systems approach can be more sustainable than narrowly focused interventions (83).



## 8.5 Summary

### 8.5.1 What Went Well

- Active Together patients had a significantly lower risk of dying within one year after surgery compared to those who declined the service or were part of historical data.
- The service demonstrated a £366.36 saving per patient compared to the declined group, indicating a positive return on investment for Active Together.
- Active Together enabled complex patients who might otherwise have been excluded to access surgery, showing its positive impact on patient care pathways.
- Upper GI patients experienced shorter lengths of stay and less time in critical care compared to historical and declined groups, with meaningful improvements in both metrics.
- Colorectal patients spent less time in critical care compared to the historical group, highlighting the programme’s effectiveness in reducing critical care needs.

### 8.5.2 Recommendations for the Future

- Continue to focus on improving access to surgery for complex patients and further investigate how Active Together impacts their overall hospital stay and recovery.
- Continue to monitor and evaluate the long-term impacts of the service on survival rates, quality of survival, and healthcare utilisation to fully understand the benefits and refine the intervention as needed.
- Continue to optimise staffing and premises costs as patient numbers increase and improve cost efficiency.
- Further exploration of the anticipated broader healthcare and cost benefits of the service is needed. This should include the following as a minimum: improvements in quality and length of life (84), cost savings for patients undergoing other treatment types such as radiotherapy systemic anti-cancer therapy, and potential savings in primary and social care through reduced demand and earlier return to work and meaningful activity.



## Elaine's experience

“The surgeon warned me before I went in that I could be in intensive care for at least a week after my operation. I was in overnight, and that was it. The surgeon was really impressed.”

Elaine was scheduled to have surgery and was referred to Active Together to help her prepare. She explained:

“There's always been somebody with me, and they've always been attentive towards me, and to be honest, they got me through the operation because they really improved my movement.”



# 9 Fidelity of Service Delivery

## 9.1 Was Active Together Delivered as Intended?

### 9.1.1 Treatment Fidelity

An innovation in the Active Together evaluation was its examination of treatment fidelity. Treatment fidelity is the degree to which an intervention is delivered as intended (85). Specifically in a service setting, treatment fidelity indicates that all providers have done what they were trained to do, intended to do, and what they promised to do with integrity. It ensures that the service is implemented consistently and accurately, which is crucial for evaluating its effectiveness and reliability. Treatment fidelity ensures that effective and reliable services are delivered (86). However, this level of inquiry is uncommon in real-world settings (14) and has not been implemented in cancer prehabilitation and rehabilitation services, making it a novel aspect of the Active Together evaluation.

A comprehensive treatment fidelity framework was implemented (17) and adapted for use within a real-world setting. The methods are described in the published protocol (18). Various data sources were used, including focus groups, interviews, session observations of the Active Together team, and interviews and surveys from patients and healthcare professionals. The findings indicated that the core components of the service adhered to the established protocol at least 80% of the time, demonstrating very good treatment fidelity (17). This strong adherence emphasises the service's commitment to reliable and effective service delivery.

### 9.1.2 Protocol Adjustments

The Active Together team created three versions of a logic model, updated annually, to outline the service's development and implementation processes. A logic model is a visual representation that outlines how the service is intended to work. It illustrates the relationships between resources, activities, outputs, and outcomes, showing how specific actions are intended to lead to desired results. Appendix 7 summarises the final iteration of the Active Together service logic model. This offers a detailed blueprint of what has been delivered and highlights the careful attention, comprehensive planning, and thorough consideration in the development and execution of the service.

Protocol deviations were managed and recorded through a detailed deviation log, which included descriptions, reasons, and dates of changes. Adjustments were primarily made in response to patient feedback, evaluation insights, and increased service demands; 12 key deviations were recorded. For example, a fatigue management service was introduced based on patient feedback. Additionally, two additional physiotherapists were recruited to handle the increasing complexity of patient cases and to meet the rising demand for assessments and sessions with greater clinical expertise.

The COVID-19 pandemic had the most significant impact on the Active Together service implementation and delivery. Active Together was launched during rapidly changing government regulations and shifting healthcare priorities. The service encountered significant challenges, including delays in its start time. Ensuring strict governance and safety procedures became crucial, given the heightened risk of complications for cancer patients. The Active Together team followed guidance from NHS England and Sheffield Teaching Hospitals NHS Foundation Trust, implementing flexible and adaptive measures to prioritise patient care and safety. Notable adaptations included social distancing and transitioning to virtual sessions for patients undergoing chemotherapy to minimise face-to-face interactions.

To our knowledge, this is the first evaluation to conduct an in-depth assessment of treatment fidelity within a cancer prehabilitation and rehabilitation service. It sets a precedent for using transparent treatment fidelity methods, enhancing service credibility and demonstrating a commitment to excellence.

## 9.2 Summary

### 9.2.1 What Worked Well

- Adhering to the original Active Together protocol whilst adapting the service based on evaluation and patient feedback. This ensured that the service remained relevant, effective, and responsive to the evolving needs of patients. This approach can enhance the quality and effectiveness of care and promote higher patient satisfaction and engagement levels.
- Embedding evaluation observations into practice allowed for service improvement, fostering a learning culture that can lead to better overall outcomes.
- Involving the whole team in developing the Active Together service logic model brought diverse perspectives, enhanced collaboration, and ensured a shared understanding of the project, leading to better decision-making and more effective outcomes.

### 9.2.2 Recommendations for the Future

- Continue applying best practices in documenting treatment fidelity whilst supporting evidence-based improvements to drive continuous service improvement.
- Use this evaluation as a benchmark for treatment fidelity procedures and a model for guiding other services to implement similar methods. This approach can enhance service delivery, enable replication, and increase intervention effectiveness, ultimately contributing to a higher standard of care for cancer patients.

# 10 Conclusions

The evidence supporting the role of prehabilitation and rehabilitation as part of cancer treatment is expanding, including international guidance on content and approach (87). Despite this, insight from services that deliver these interventions at scale, within existing clinical pathways, is less common.

**The evaluation of Active Together shows that a multi-modal prehabilitation and rehabilitation service for people with a cancer diagnosis can improve functional outcomes, quality of life, and emotional wellbeing for patients. These improvements translated into cost savings of £366.36 per patient, driven by reductions in hospital length of stay and associated health care costs. Most encouragingly, an improvement in 1-year survival was observed compared to historical data.**

Data confirmed that the service engaged successfully with individuals facing the highest levels of social and economic disadvantage, thereby contributing to efforts to reduce health inequalities. That said, there is scope to expand the evaluation with the inclusion and impact of the service on diverse communities. This includes more detailed analysis disaggregating data by protected characteristics. Patients and healthcare professionals responded positively to their experiences with the Active Together service. Clinicians praised the service for seamlessly integrating into the cancer care pathway, enhancing

the overall treatment experience, and providing a time-efficient referral process. They view this service as an essential part of comprehensive cancer care, recognising its role in supporting recovery and improving quality of life for patients. Patients felt supported, had deep trust and confidence in the staff and believed that interventions (physical activity, dietetic and psychological support) were tailored to their needs. The service can do more to support patients in successfully transitioning from the service.

Combined with the positive financial return on investment, data from this evaluation provides a compelling case for the continued implementation and expansion of the service to other regions. Maintaining the current service in Sheffield will minimise disruption for health professionals and ensure continuity of patient care. Retaining established effective services helps prevent gaps in care, supports the stability of the healthcare workforce, and ensures that patients receive consistent, high-quality care without interruption.

Implementing the recommendations outlined within this report in the design of future services can enhance effectiveness, broaden reach, and maintain a commitment to high-quality, patient-centred care.

In summary, the Active Together service has established trust amongst patients and clinicians, become embedded within existing care pathways, and has demonstrated a meaningful impact on people with cancer diagnoses in South Yorkshire. The findings from this report provide real-world insights that can be used by commissioners, clinicians, researchers, health professionals and exercise professionals working across the cancer care continuum.

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# Supplementary Material

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## Appendices

### Appendix 1. Goals for each component of Active Together

Category	Prehab – Optimise health to support treatment resilience and effectiveness	In Treatment – Symptom management and maintenance of healthy behaviours	Restorative – Re-building fitness and maintaining healthy behaviour changes	Supportive – Managing healthy behaviours independently and return to activities of daily living
<b>Fitness and exercising</b>	Improve cardiovascular fitness and strength for resilience to treatment and prevention of cachexia/sarcopenia	Encourage engagement in appropriate levels of activity where possible	Re-build cardiovascular fitness, strength, and confidence to exercise	Patient exercising confidently and regularly away from Active Together
<b>Targeted physical support</b>	Support condition-specific exercise or activity to reduce disease or treatment effects	Support with functional or exercise adaptations as required by treatment	"What matters to you"? Setting functional goals and plans to achieve them	Confident in progressing return to functional activities – work, hobbies, social roles
<b>Co-morbidities</b>	Ensure pre-existing long-term conditions are as well managed as possible	Monitor and escalate any health concerns or deterioration	Empowering patient to access support for health concerns or deterioration	Confident to manage ongoing health concerns, side effects, or deterioration
<b>Nutrition and diet</b>	Optimise nutritional status through dietary advice and oral supplementation if needed	Encourage maintenance of good nutritional status, advising and adapting as necessary	Encourage maintenance of nutritional status, including adaptations as result of treatment	Embedding a balanced diet and weight management into everyday life
<b>Emotional well-being</b>	Support with management of emotions relating to diagnosis and treatment	Support with management of emotions during treatment and treatment side effects	Support for management of emotions relating to treatment outcomes	Has strategies to manage emotions if required
<b>Education and information</b>	Prepare for treatment with information and planning advice	Support symptom and side effect management	Support understanding of the post-treatment effects and rehabilitation	Confident in understanding and addressing consequences of treatment
<b>Lifestyle changes</b>	Support smoking cessation and alcohol/drug reduction	Support maintenance of healthy behaviours – smoking cessation and alcohol reduction	Support maintenance of healthy behaviours – smoking cessation and alcohol reduction	Maintaining smoking cessation/safe drinking

## Appendix 2. Data Analysis methods

Measures	Comparison	Descriptive statistics	Analytic statistics
Assessment outcomes	Between assessments.	Psuedomedian (as calculated by Wilcoxon signed rank test) with 95% confidence interval as the data was not normally distributed.	Pairwise Wilcoxon signed rank test with Benjamini-Hochberg corrections the seven comparisons. P < 0.05 was considered statistically significant.
	Between tumour groups, ethnicity and genders (only presented when significant) comparing changes from baseline to the final assessment.	R value was transformed into Cohen's d effect size, with 0.2 considered the threshold for a meaningful difference, although clinically important differences were used where available.	Kruskal-Wallis tests with follow up Wilcoxon signed rank test with Benjamini-Hochberg corrections. P < 0.05 was considered statistically significant.
	Relationship of changes from baseline to the final assessment to age and index of multiple deprivations (none presented as not significant).		Spearman correlation. P < 0.05 was considered statistically significant.
Hospital resource use	Between Active Together, Declined and Historical groups.	Mean with 95% confidence interval.	Wilcoxon signed rank test with Benjamini-Hochberg corrections for two comparisons. P < 0.05 was considered statistically significant.
		R value was transformed into Cohen's d effect size, with 0.2 considered the threshold for a meaningful difference.	
Survival	Between Active Together, Declined and Historical groups.	Percentage survival at 1 year with 95% confidence interval, Hazard ratio with 95% confidence interval.	Cox proportional hazards regression model. P < 0.05 was considered statistically significant.

## Appendix 3. The number of patients that left at each stage of the service

	Before first appointment	Prehab	Maintenance	Restorative	Supportive	After last assessment
Declined	155	0	0	0	0	0
Left Early	5	28	34	36	4	0
Died	3	9	10	5	0	0
Early Completer*	0	7	24	11	6	0
Completed	0	0	0	0	0	169
Current Patient	32	90	82	66	33	2
Left during this stage (% of remaining*)		35 (7%)	58 (15%)	47 (18%)	10 (6%)	
Completed this stage (% of remaining*)		482 (93%)	332 (85%)	214 (82%)	171 (94%)	
<b>Completion Rate*</b>		<b>93%</b>	<b>80%</b>	<b>66%</b>	<b>62%</b>	

\*Not including patients who died while in the service. †Those that gave their reason for leaving the service as 'self-managing', but left before the final assessment.

## Appendix 4. Referrals, acceptance rates and demographics for each tumour group

Characteristic	Group	Number of Referrals	% of total referrals	Acceptance rate
Tumour group	Colorectal	344	42.4	85.8
	Lung	308	38.0	72.7
	Upper GI	159	19.6	86.2
Sex	Male	436	53.8	81.4
	Female	375	46.2	80.3
	White	687	84.7	83.0
Ethnicity	Black, African, Caribbean or Black British	9	1.1	77.8
	Asian or Asian British	9	1.1	88.9
	Mixed or Multiple ethnic groups	4	0.5	100.0
	Other ethnic group	8	1.0	100.0
	Not stated/Unknown	94	11.6	62.8
Index of multiple deprivation	1	164	20.2	77.4
	2	104	12.8	71.2
	3	83	10.2	79.5
	4	57	7.0	73.7
	5	70	8.6	82.9
	6	73	9.0	84.9
	7	77	9.5	83.1
	8	65	8.0	84.6
	9	51	6.3	86.3
	10	59	7.3	89.8
	Not stated/Unknown	8	1.0	62.5
Age	<30	1	0.1	100.0
	30-39	6	0.7	66.7
	40-49	33	4.1	93.9
	50-59	108	13.3	86.1
	60-69	262	32.3	80.2
	70-79	325	40.1	77.5
	80-89	74	9.1	85.1
	>89	2	0.2	100
	<b>Total</b>		<b>811</b>	<b>100.0</b>

## Appendix 5. Assessment Outcome Results

Outcome measure	Baseline	Change from baseline			
		Pre-treatment	Post-treatment	Post-restorative phase	Post-supportive phase
<b>Six-minute Walk test distance (metres)</b>					
Sample size	N = 224	N = 91	N = 163	N = 85	N = 62
Median	460	+27	-17	+16	+20
95% CI	445 – 475	+14.5 – +38.5	-27 – -7.5	+3 – +29	+5.5 – +34
P-value		<0.001*	<0.001*	0.019*	0.010*
Effect size		0.99	0.59	0.53	0.72
<b>60s sit-to-stand (repetitions)</b>					
Sample size	N = 117	N = 69	N = 74	N = 35	N = 14
Median	25	2	-3	2.5	2.5
95% CI	24 – 27.5	0 – 4	-5 – -1	0.5 – 4	-2 – 5.5
P-value		0.083	0.009*	0.056*	0.350
Effect size		0.47	0.71	0.78	0.58
<b>30s sit-to-stand (repetitions)</b>					
Sample size	N = 162	N = 79	N = 105	N = 45	N = 31
Median	13.5	2	-1	1	-0.5
95% CI	13 – 14.5	1 – 2.5	-2 – 0	-0.5 – 3	-2 – 1
P-value		0.002*	0.033*	0.159	0.506
Effect size		0.90	0.48	0.46	0.24
<b>FACIT (fatigue)</b>					
Sample size	N = 329	N = 122	N = 214	N = 138	N = 140
Median	39	2.5	-3.5	0.5	1.5
95% CI	37.5 – 40.5	0.5 – 4	-5 – -2	-0.5 – 2	-0.5 – 3
P-value		0.010*	<0.001*	0.361	0.173
Effect size		0.52	0.61	0.16	0.26
<b>Handgrip strength (kg) – Dominant hand</b>					
Sample size	N = 278	N = 109	N = 218	N = 114	N = 78
Median score	28.0	0.3	-1.8	-1.1	-1.1
95% CI	26.9 – 29.2	-0.4 – 1.0	-2.3 – -1.3	-1.9 – -4.0	-1.9 – -0.2
P-value		0.469	<0.001*	0.007*	0.016*
Effect size		0.14	0.99	0.58	0.60
<b>Handgrip strength (kg) – Non-dominant hand</b>					
Sample size	N = 278	N = 110	N = 217	N = 113	N = 76
Median score	26.7	-0.2	-2.2	-1.7	-1.1
95% CI	25.6 – 27.8	-0.8 – 0.5	-2.7 – -1.6	-2.5 – -0.9	-2.2 – -0.1
P-value		0.583	<0.001*	<0.001*	0.049*
Effect size		0.10	1.15	0.84	0.50

\*Statistically significant

Outcome measure	Baseline	Change from baseline			
		Pre-treatment	Post-treatment	Post-restorative phase	Post-supportive phase
<b>Body Mass Index (kg/m<sup>2</sup>)</b>					
Sample size	N = 292	N = 122	N = 229	N = 119	N = 82
Median	28.4	-0.2	-1.2	-0.7	-0.4
95% CI	27.8 – 29.1	-0.4 – -0.1	-1.5 – -1.0	-1.0 – -0.3	-0.9 – 0.0
P-value		0.004*	<0.001*	<0.001*	0.040*
Effect size		0.56	1.68	0.75	0.00
<b>Waist-to-Hip Ratio</b>					
Sample size	N = 278	N = 110	N = 217	N = 113	N = 76
Median	0.92	0.01	-0.01	0.01	0.02
95% CI	0.90 – 0.93	0.00 – 0.02	-0.02 – -0.01	0.00 – 0.02	0.00 – 0.03
P-value		0.002*	<0.001*	0.274	0.014*
Effect size		0.69	0.65	0.00	0.06
<b>Short Form Patient-Generated Subjective Global Assessment (nutritional status)</b>					
Sample size	N = 276	N = 77	N = 187	N = 124	N = 36
Median score	4	-0.5	1	-2	-1
95% CI	3.5 – 4.5	-1.5 – 1	0 – 2	-2.5 – -1	-3 – 0.5
P-value		0.563	0.034*	<0.001*	0.234
Effect size		0.17	0.36	0.76	0.52
<b>Exercise Vital Signs (physical activity min/week)</b>					
Sample size	N = 301	N = 113	N = 191	N = 124	N = 122
Median score	170	75	-35	17.5	25
95% CI	150 – 195	35 – 114.5	-620 – -10	-13 – 45	-7.5 – 55
P-value		0.002*	0.011*	0.298	0.191
Effect size		0.66	0.41	0.21	0.27
<b>Self-Efficacy for Exercise</b>					
Sample size	N = 210	N = 78	N = 120	N = 79	N = 77
Median score	55.5	6.5	-1	4.5	3.5
95% CI	52 – 58	1.5 – 12	-6 – 4	-1 – 9.5	-1.5 – 9.5
P-value		0.044*	0.666	0.163	0.193
Effect size		0.59	0.08	0.38	0.34
<b>EQ-5D Index (Health-related quality of life)</b>					
Sample size	N = 311	N = 122	N = 203	N = 132	N = 127
Median score	0.76	0.00	-0.06	0.02	-0.02
95% CI	0.74 – 0.77	-0.04 – 0.04	-0.09 – -0.03	-0.01 – 0.05	-0.05 – 0.01
P-value		0.934	0.002*	0.226	0.319
Effect size		0.02	0.54	0.25	0.20

\*Statistically significant

Outcome measure	Baseline	Change from baseline			
		Pre-treatment	Post-treatment	Post-restorative phase	Post-supportive phase
<b>EQ-5D Visual Analogue Scale (Health-related quality of life)</b>					
Sample size	N = 307	N = 114	N = 198	N = 127	N = 125
Median score	65	7.5	-0.5	10	7.5
95% CI	62.5 – 68	2.5 – 12	-5 – 4	5 – 15	2.5 – 12.5
P-value		0.009*	0.707	0.004*	0.003*
Effect size		0.55	0.07	0.67	0.63
<b>GAD-7 (Anxiety)</b>					
Sample size	N = 340	N = 136	N = 241	N = 144	N = 130
Median score	5.5	-1.5	-1.5	-2	-2
95% CI	4.5 – 6.5	-2.5 – -0.5	-2 – -0.5	-2.5 – -1	-2.5 – -1
P-value		0.003*	0.001*	<0.001*	<0.001*
Effect size		0.56	0.47	0.77	0.74
<b>PHQ-9 (Depression)</b>					
Sample size	N = 340	N = 136	N = 241	N = 144	N = 130
Median score	6	-1	0.5	-1.5	-1.5
95% CI	5.5 – 7	-2 – 0	-0.5 – 1.5	-2 – -1	-2.5 – -0.5
P-value		0.013*	0.333	0.002*	0.012*
Effect size		0.46	0.14	0.63	0.49

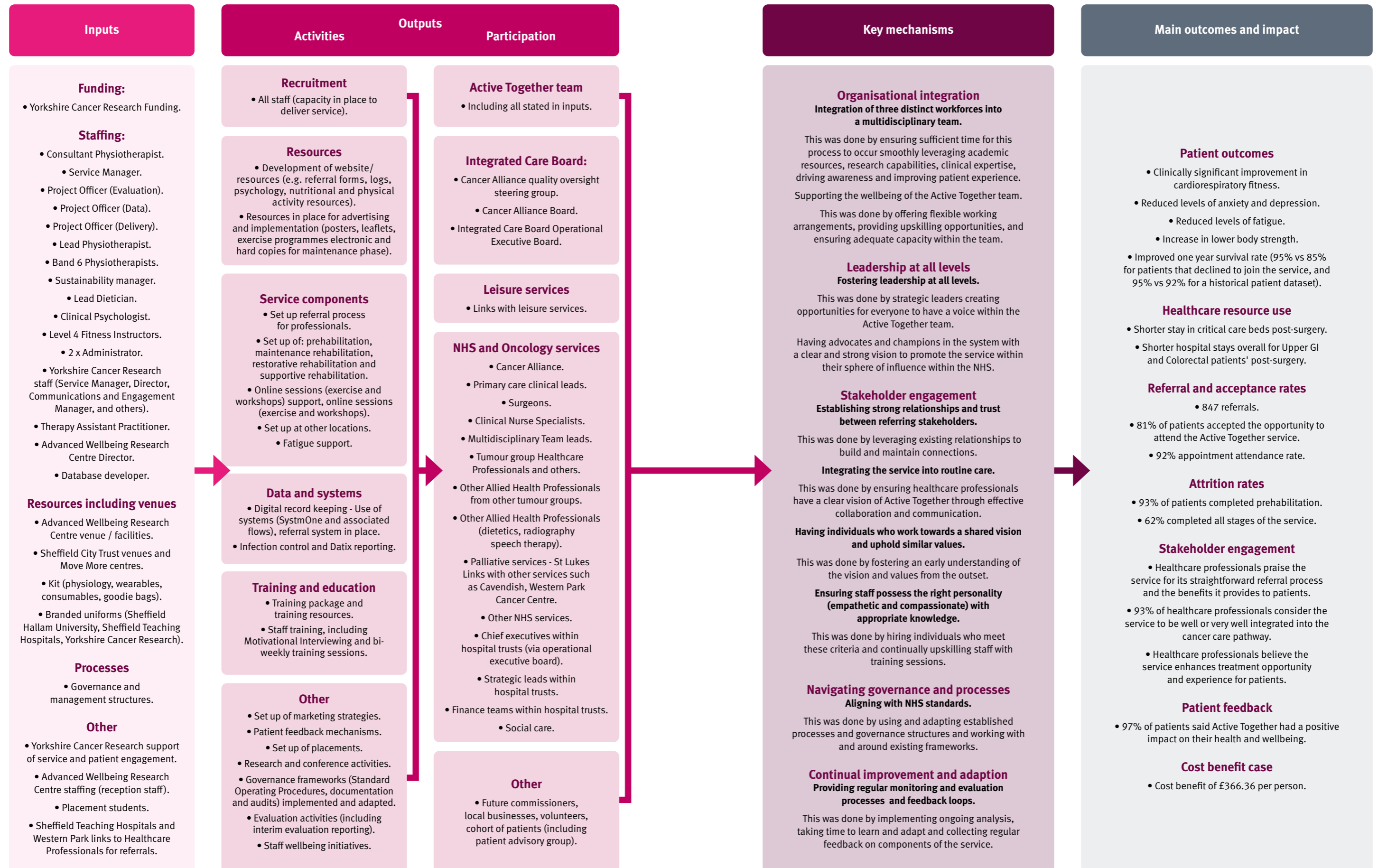
\*Statistically significant

## Appendix 6. Included Hospital Procedures

Procedure	Before first appointment
Lobectomy of lung	E543
Excision of segment of lung	E544
Partial lobectomy of lung NEC	E545
Total pneumonectomy	E541
Other specified excision of lung	E548
Bi-lobectomy of lung	E542
Excision of segment of lung	E544
Partial gastrectomy and anastomosis of stomach to transposed jejunum	G282
Anterior resection of rectum and anastomosis NEC	H334
Anterior resection of rectum and exteriorisation of bowel	H336
Sigmoid colectomy and anastomosis NEC	H103
Anterior resection of rectum and anastomosis of colon to rectum using staples	H333
Right hemicolectomy and anastomosis NEC	H073
Left hemicolectomy and end to end anastomosis of colon to rectum	H091
Abdominoperineal excision of rectum and end colostomy	H331

Procedure	Before first appointment
Extended right hemicolectomy and anastomosis of ileum to colon	H062
Right hemicolectomy and end to end anastomosis of ileum to colon	H071
Rectosigmoidectomy and closure of rectal stump and exteriorisation of bowel	H335
Extended right hemicolectomy and anastomosis NEC	H063
Panproctocolectomy and ileostomy	H041
Right hemicolectomy and side to side anastomosis of ileum to transverse colon	H072
Loop colostomy	H151
Excision of lesion of anterior abdominal wall NEC	T313
Peranal excision of lesion of rectum	H412
Proctectomy and anastomosis of colon to anus	H332
Right hemicolectomy and ileostomy HFQ	H074
Extended right hemicolectomy and end to end anastomosis	H061
Left hemicolectomy and anastomosis NEC	H093
Colectomy and end to end anastomosis of colon to colon NEC	H111
Other specified other excision of right hemicolon	H078
Unspecified excision of left hemicolon	H099
Perineal resection of rectum HFQ	H337
Extended right hemicolectomy and end to side anastomosis	H065
Left hemicolectomy and end to end anastomosis of colon to colon	H092
Right hemi hepatectomy NEC	J021
Colectomy and anastomosis NEC	H113
Transverse colectomy and end to end anastomosis	H081
Other specified excision of rectum	H338
Sigmoid colectomy and anastomosis of colon to rectum	H102
Other specified excision of lesion of anus	H488
Extended right hemicolectomy and ileostomy HFQ	H064
Left hemicolectomy and exteriorisation of bowel NEC	H095
Endoscopic resection of lesion of lower bowel using fiberoptic sigmoidoscope NEC	H236
Anterior resection of rectum and exteriorisation of bowel	H336
Right hemicolectomy and ileostomy HFQ	H074
Oesophagogastrectomy and anastomosis of oesophagus to stomach	G011
Total gastrectomy and anastomosis of oesophagus to jejunum NEC	G275
Total gastrectomy and anastomosis of oesophagus to transposed jejunum	G274
Partial gastrectomy and anastomosis of stomach to jejunum NEC	G283
Other specified open extirpation of lesion of oesophagus	G048
Partial gastrectomy and anastomosis of stomach to duodenum	G281
Unspecified excision of oesophagus and stomach	G019
Fiberoptic endoscopic mucosal resection of lesion of upper gastrointestinal tract	G423
Oesophagogastrectomy and anastomosis of oesophagus to stomach	G011

## Appendix 7. Logic Model





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## Contact Us

Would you like to find out more about our work?  
Interested in working with us? We'd love to chat.

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