Healthcare Improvement Scotland | SHTG Advice on health technologies

SHTG Assessment
April 2024

In response to an enquiry from the Scottish Government's Cancer and Rehabilitation Unit

A review of the evidence for the effectiveness of digital delivery of cancer prehabilitation

Key messages

1. Prehabilitation programmes form an important part of preparing patients for their cancer treatments; helping to optimise outcomes and quality of life and minimise the side effects of treatment. Prehabilitation should be delivered as set out in the Key Principles – Prehabilitation for Scotland.

2. There is insufficient published evidence or local evaluation data to make any conclusions about the clinical or cost-effectiveness of digitally delivered prehabilitation programmes for patients with cancer.

3. Projects designed to evaluate digital prehabilitation for patients with cancer should consider the SHTG Evidence Framework to guide the collection of relevant data in order to inform decision making on the use of digital prehabilitation programmes.

What were we asked to look at?

We were asked to assess the clinical and cost effectiveness of digitally delivered prehabilitation programmes for patients with cancer. We sought to examine the impact of digital programmes on post-treatment outcomes including length of hospital stay, unanticipated readmission rates and patients' quality of life. The scope of this assessment included adult patients from all socioeconomic groups with all cancer types and receiving all types of cancer treatment.

Why is this important?

The incidence of cancer diagnosis is increasing, with a 5.5 % increase in new cancers registered in 2021 compared with 2019. This increase is adding pressure to the timely delivery of high quality support to patients throughout their cancer care.[1]

Prehabilitation is intended to be the first step for patients following a cancer diagnosis[2] as highlighted in the 2023 Scottish Cancer Strategy.[1] Prehabilitation prepares people with cancer for treatment through programmes that can include exercise, nutritional support, psychological support and assistance with alcohol and tobacco reduction or cessation. Prehabilitation programmes aim to minimise the side effects of treatment and improve patient quality of life. The planned implementation of prehabilitation is outlined in the Scottish Government's Key Principles – Prehabilitation for Scotland.[3]

The Scottish Government is working collaboratively with partners to introduce tiered, multimodal prehabilitation to rehabilitation for people affected by cancer in Scotland. It is anticipated that this end to end process will benefit from the application of digital technologies.[4]

What was our approach?

We reviewed the published evidence on the clinical effectiveness, cost effectiveness, and practitioner and patient acceptability of prehabilitation programmes that were digitally delivered or had a digital support element. We contacted NHSScotland health boards who were conducting their own digital prehabilitation programmes with a view to assessing their local data.

More information about SHTG assessments can be found on our website.

What next?

Our assessment will be used by the Scottish Government Cancer Prehabilitation Oversight Group to inform the national delivery of prehabilitation within Scotland. The assessment will also inform an enquiry to the Accelerated National Innovation Adoption (ANIA) pathway by the Cancer and Rehabilitation Unit at Scottish Government. The assessment will be made available to clinicians and the public via the SHTG website.

Key points from the evidence

1. The published evidence on the effectiveness of digital prehabilitation programmes for patients with cancer is of low quantity and quality.

    - One UK prospective observational study (n=139) identified significant improvements in emotional wellbeing and anxiety between baseline and 12 weeks postoperatively.[5] The study found that it is feasible to recruit patients to digital prehabilitation programmes. A small focus group of patients (n=7) did not raise a prior lack of digital ability and literacy as barriers to participation.

    - A Belgian based cohort study (n=23) of a single prehabilitation intervention in patients with oesophagogastric cancer concluded that a digital prehabilitation is feasible, showing high retention rates (96 %) and high patient satisfaction.[6] In this small group of patients, digital prehabilitation led to significant improvements in emotional wellbeing, with no differences found in other patient reported outcome measures.

2. Digital prehabilitation programmes are acceptable to patients but providers remain concerned about digital inclusion relating to socioeconomic deprivation and lower digital literacy.[5]

3. No studies were identified that assessed the cost effectiveness of digital prehabilitation. No data were available from health boards in Scotland. The absence of evidence and local data meant that no cost effectiveness analysis or budget impact modelling could be performed.

4. Further research is required to inform the use of digital prehabilitation programmes in NHS Scotland. The SHTG Evidence Framework should be used to help inform data collection, for example:

    - prespecified patient and service outcome data should be collected, alongside the costs of the technology

    - patient and clinical views should be collected on the suitability of digitally delivered programmes (especially compared with non-digital prehabilitation).

Contents

Definitions

Prehabilitation - a process that prepares people for cancer treatment by optimising their physical and mental health through needs-based exercise and nutritional support and psychological interventions.[7] The aim is to improve treatment effectiveness and cancer survival. Prehabilitation is an element of rehabilitation that starts before treatment has begun.

Multidisciplinary Team - a multidisciplinary team (MDT) in healthcare is a group of professionals from various disciplines who collaborate to provide comprehensive care for patients. These teams bring together the unique skills and expertise of each member, ultimately resulting in improved patient outcomes.

Introduction

The Scottish Government's cancer strategy describes prehabilitation as the beginning of provision of timely, effective and individualised care for every person diagnosed with cancer.[1] Prehabilitation is highlighted as a key step in preparing people for treatment using a multimodal approach that includes exercise, nutritional and psychological support and help with alcohol and tobacco reduction or cessation. The aim of prehabilitation programmes is to improve treatment outcomes such as quality of life and complications after cancer treatments such as surgery. Key principles for the delivery of prehabilitation in Scotland are outlined in the Key Principles – Prehabilitation for Scotland document.[3]

A patient's prehabilitation requirements should be assessed on an individual basis through an MDT screening process. The delivery of prehabilitation should align with usual decision making processes so that there are no adverse effects on cancer treatment waiting times.

Prehabilitation is an area of importance within the Scottish healthcare setting. The mode of delivery is important to ensure prehabilitation is accessible to all patients and there is a need to understand if prehabilitation can be effectively delivered using digitally supported methods. [8] For example, can the use of standalone mobile or telehealth applications replicate the improvements in patient outcomes achieved by in-person prehabilitation programmes, or can in-person programmes be improved through the use of digital tools.

Health technology description

Digital prehabilitation refers to prehabilitation services for patients with a cancer diagnosis that use an element of digital technology in their delivery. The definition of digital technology is broad and includes smartphone apps, wearable devices, for example smart watches, and platforms that provide remote healthcare including video and telephone appointments. There is limited provision of digital prehabilitation within Scotland.

Research question

What is the evidence on the clinical and cost effectiveness and patient acceptability of digitally supported prehabilitation programmes for patients with a cancer diagnosis prior to definitive treatment?

What is the evidence around any barriers and facilitators of accessing digitally supported prehabilitation?

Literature search

A systematic search of the secondary literature was carried out between 30 October 2023 to 6 November 2023 to identify systematic reviews, health technology assessments and other evidence-based reports. Databases searched include Medline, Embase, Cinahl and Cochrane.

The primary literature was systematically searched at the same time using the following databases: Medline, Embase, Cinahl. Results were limited to English language publications.

Key websites were searched for guidelines, policy documents, clinical summaries, economic studies and ongoing trials.

Concepts used in all searches included: *prehabilitation, perioperative, digital, website, mobile app, telehealth, cancer, neoplasms*. A full list of resources searched and terms used is available on request.

Clinical effectiveness

The research evidence on the clinical effectiveness of digital prehabilitation for patients with a cancer diagnosis is limited. Our search found only two studies which reported on clinical effectiveness post-treatment.[5, 6]

The first study was a prospective observational study, which evaluated the feasibility and effects of a telehealth delivered prehabilitation programme for patients with cancer in the south of England.[5] The study was prompted by the COVID-19 pandemic and the authors sought to understand if their face-to-face prehabilitation programme could be adapted to be delivered remotely. The primary outcome was the feasibility of delivering the existing service via digital means, and secondary measures investigated the relationship between the new programme and patient reported outcomes. Eligible patients awaiting cancer treatment were identified from multiple centres and referred to the tele-based prehabilitation service. The intervention included physical activity, nutritional education, medical optimisation therapies and psychosocial support. An initial screening call, via video or telephone, was carried out by physiologist who also carried out a baseline assessment to gather data on the patient's health status, medical history (including smoking and alcohol use), current medications, well-being, quality of life, physical activity levels, and to assess the need for clinical nutritional intervention using the Malnutrition Universal Screening Tool (MUST). For

the duration of their time in the prehabilitation programme (mean duration 4 weeks) participants were contacted up to twice a week based on their preferences and needs. The secondary outcome was to measure changes in patient-reported outcomes post-prehab, focusing on symptom reduction, particularly in health-related quality of life and cancer-related fatigue. The EQ-5D-3L and FACIT-Fatigue Scale were administered at programme enrollment as baseline and post-programme completion for surgical patients, and post-cancer treatment for non-surgical patients. These results were also used to evaluate the feasibility of the service. Of the 66 participants who returned completed questionnaires, seven were undergoing chemotherapy and/or radiotherapy, 54 were undergoing surgery only and five were undergoing chemotherapy and surgery.

The service was found to be feasible. Of 182 patients referred from nine hospital trusts and three general practices, 139 agreed to take part in the study. At the time of publishing, 100 patients had completed the programme and the study was ongoing. A total of 66 patients were able to return completed questionnaires. Patient acceptability of the intervention was explored with seven participants in a focus group. The demographics of this small group were not provided. There was positive feedback about the telehealth format of the programme, relating to the benefits of its flexibility, accessibility and social support and negating the need to exercise in front of others. Limitations of the online programme included not being able to meet other people and a potential issue with self motivation; participants missed the opportunity for peer support. The authors had anticipated a challenge relating to lack of digital ability and literacy, but this was not raised as a barrier to participation. Participants highlighted that the cost of digital equipment (which may be required to facilitate digital prehabilitation) could potentially be prohibitive for some patients.

For PROMS, the digital prehabilitation programme led to statistically significant improvements in the Euroqol visual analogue scale (EQ-VAS) (before: 75 (65–86) vs. after: 80 (70–90); $p = 0.001$) and FACIT-Fatigue Scale(before: 44 (38–48) vs. after: 47 (43–50); $p = 0.000$), based on completion of the questionnaires before and after the programme. There were no improvements in quality of life, measured using the EQ-5D-3L, over the same period (before: 0.796 (0.691–0.857) vs. after: 0.796 (0.725–1.000); $p = 0.092$).

A small study of 23 participants explored the feasibility and preliminary effectiveness of a single intervention tele-prehabilitation programme for patients with oesophagogastric cancer.[6] The intervention consisted of internet based aerobic, resistance and inspiratory muscle training over a 2–4 week period using the Virtuagym© fitness application. The programme was personalised by the physiotherapist based on an initial assessment of function. Prerecorded exercise videos and descriptions were available through the application. The primary outcome was feasibility measured through recruitment, retention attendance rates, adverse events and patient satisfaction. Secondary outcome measures included: functional exercise capacity, cancer related fatigue and anxiety and depression. These were measured at baseline, presurgery, 4 weeks postsurgery and 12 weeks postsurgery.

The intervention was found to be feasible with recruitment rate of eligible patients was 96% (n = 23) and retention rate was 96% (n = 22), an overall attendance rate of 77 % (182 of 237 scheduled aerobic and resistance training sessions were completed) and no reported adverse events. The

median satisfaction score was 9.0 on a 10-point scale. In response to a question on the clarity of the internet based programme, 15 % of the participants (n=3) reported that they were unsatisfied or not at all satisfied.

For PROMS, no statistically significant difference was observed between baseline and after prehabilitation for the 6 minute walking test (6MWT) (+26.8m, 95 % CI 95 % -0.5 to 54.1, p>0.05) and a significant decline in 6MWT from presurgery to 4 weeks postoperative (-74.2m, 95 % CI -142.3 to -5.1, p=0.003). This was followed by a significant improvement in 6MWT from 4 weeks to 12 weeks postoperative (+97.4m, 95 % CI 30.9 to 163.8, p<0.001). At 12 weeks postsurgery, no changes were observed for the 6MWT, FACIT-F, the physical wellbeing (FWB), social/family wellbeing (SWB) and functional wellbeing (FWB) categories of the Functional Assessment of Cancer Therapy General (FACT-G), and the depression category of the Hospital Anxiety and Depression Scale (HADS-D) compared with baseline. For emotional wellbeing (EWB) and Hospital Anxiety and Depression Scale – Anxiety (HADS-A), significant improvements were observed over the same 12 week period (+2.3 points, 95 % CI 0.3 to 4.3, p=0.003) and (-2.2, 95 % CI -4.8 to -0.4, p=0.0008) respectively.

Patient views of digital prehabilitation

In a cross-sectional study carried out in Australia, thirty patients recovering from gastrointestinal cancer surgery were asked to undertake an online multimodal prehabilitation programme (using an iPad) and complete a study specific questionnaire after a 24-hour period of access to the programme. They identified the simplicity and perceived benefits to patients of the programme as the main facilitators to its uptake. The identified barriers to uptake related to poor preoperative health, lack of motivation and lack of encouragement. The participants felt that a preoperative online prehabilitation programme would be safe to undertake at home and would be of potential benefit to their health. The authors concluded that online programmes support effective prehabilitation, but highlighted that the efficacy and safety of such programmes would need to be assessed.

Cost effectiveness

Cancer prehabilitation programmes have the potential to deliver improvements in patients' quality of life alongside cost savings.[9-12] No studies were identified that carried out analysis to demonstrate the cost effectiveness of either digital or non-digital prehabilitation programmes.

We were informed that digital prehabilitation programmes for people diagnosed with cancer are ongoing across NHSScotland; for example in NHS Lothian, NHS Ayrshire and Arran and NHS Greater Glasgow and Clyde. No local data on outcomes or effectiveness were available to inform this SHTG assessment, and local cost data were insufficient to inform cost analyses.

Equality considerations

As highlighted by our peer reviewers, the provision of digital prehabilitation services in cancer care must take into account the potential for digital exclusion, particularly among older individuals, those

in deprived areas or people with limited digital literacy. Future initiatives to provide public access to technology, alongside targeted support, should help mitigate these barriers, enabling broader participation. The effectiveness of digital interventions depends on overcoming substantial challenges such as motivation, digital skills and access to technology.

The flexible and accessible care options offered by digital prehabilitation may offer considerable advantages to many, including those patients facing logistical challenges related to travel and time. The potential for digital exclusion underscores the need for careful consideration in the design and implementation of these services to ensure they are inclusive and accessible to all patients, especially those who might benefit most from prehabilitation but face the greatest barriers to access. Tailoring digital prehabilitation to accommodate diverse patient needs and preferences could be crucial in maximising its impact and equity.

Ongoing research

The evidence on digital prehabilitation is emerging. Two RCTs are underway that will inform the longer-term effectiveness of digital prehabilitation.[13, 14] One is a UK based study assessing if an app-based prehabilitation programme can reduce complications for patients following lung cancer surgery compared with usual care.[13] An RCT based in the USA is assessing the effectiveness of a prehabilitation app in reducing postsurgery complications in older patients undergoing surgery for colon cancer.[14] Recruitment to both the RCTs is due to end in late 2025.

An ongoing systematic review registered with Prospero titled 'The use of technology in Cancer Prehabilitation: A Systematic Review'[15] is expected to published.

Further research

Further research is needed to ascertain the clinical effectiveness, safety, patient view and cost effectiveness of digital prehabilitation programmes for patients with cancer.

The SHTG Evidence Framework is intended to guide the collection of information required to demonstrate service improvements. In conducting prehabilitation studies, the following may be considered:

Use of technology

A clear description of the digital prehabilitation programme should be provided. Prehabilitation encompasses a wide range of health services, including physical, nutritional and psychological interventions. The programme delivery may vary between app-based or via prerecorded or live sessions.

A description of the target population for the programme is important. Prehabilitation programmes are often tailored to specific patient populations, and use in one group may not be replicable in another. Factors such as the type and stage of cancer, patient age, comorbidities and baseline fitness

levels can significantly influence the outcomes of prehabilitation. Patient inclusion criteria should be clarified prior to data collection.

Patient pathway and comparators

Use of the digital programme should be compared with the current standard of care, so that the incremental benefits of digital delivery can be identified. It should be clear how the use of the digital programme affects or is different from the current patient pathway. Further amendments to the patient pathway (that is, beyond introducing a digital programme) should be minimised so that any changes in outcomes and costs can be more easily attributed to the change in programme. Any workforce capacity issues or the level of training needed for staff should also be scoped before implementation of the technology, or alternatively the effect of these issues on implementation can be recorded as part of a pilot scheme.

Outcomes

Outcomes should be defined at the start of an evaluation or study. The more outcomes selected, the more complex the assessment will be. It is important to consider the outcomes most relevant to decision makers, and it is important to have a robust data collection strategy in place before commencing the evaluation. Outcomes may include:

Clinical effectiveness

- clinically significant improvements in frailty, malnutrition, overweight/obesity, or physical fitness
- quality of life and wellbeing
- patient reported outcomes such as smoking cessation rates and alcohol consumption
- increase in curative treatment rates
- cancellation/delayed treatment (chemo, radiotherapy, surgery including cancellations on day of surgery), and
- postoperative complications. This field should be defined. Identify the complications to capture, and what data to collect to capture it.

Cost effectiveness

- increase in curative treatment rates
- hospital readmissions (planned or unplanned)
- length of postoperative hospital stay
- postoperative complications. This field should be defined. Identify the complications to capture, and what data to collect to capture it.
- cancellation/delayed treatment (chemo, radiotherapy, surgery including cancellations on day of surgery), and

- costs – including the costs of the digital technology and the cost of any changes to the patient pathway.

Engagement with (digital) prehabilitation programme

- Qualitative data on patients' (and clinicians') views/experiences of the programme.

Conclusion

Digital prehabilitation can offer an alternative way of delivering prehabilitation programmes to people diagnosed with cancer. There is currently a lack of evidence about the value of digital prehabilitation to patients and the health system. Further research and evaluation is required to inform decision making on the use of digital prehabilitation. Local assessments should ensure the collection and availability of relevant outcome and cost data.

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Appendix 1: abbreviations

RCT	randomised controlled trial
PROMS	patient reported outcome measures
6MWT	6-minute walking test
FACIT-F	Functional Assessment of Chronic Illness Therapy-Fatigue Scale
FACT-G	Functional Assessment of Cancer Therapy General
PWB	physical wellbeing
SWB	social/family wellbeing
EWB	emotional wellbeing
FWB	functional wellbeing
HADS	Hospital Anxiety and Depression Scale
EQ-5D-3L	Euroqol 5 dimension 3 level
EQ-VAS	Euroqol visual analogue scale