

Can-React: A personalised at-home exercise programme, supporting long-term survivorship and rehabilitation needs of cancer patients



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Cancer treatments have many adverse effects on patients' health leading to reduced health-related quality of life (HRQoL). The National-Cancer-Strategy (2017-2026) emphasises the need for effective management of post-treatment health issues for improvement in HRQoL. Improved treatment and supportive cancer care has led to increased life expectancy for cancer survivors. Cancer is a chronic disease as

survivors experience long-term adverse physical/psychological side-effects. Exercise therapy can significantly contribute to restoration by increasing functional capacity. An exercise programme that combines aerobic, resistance and flexibility exercises and is tailored to individual needs, can have a significant positive impact on patients' health and HRQoL.

The NUI Galway team, led by Dr Ananya Gupta (Director of Exercise Physiology, NUI Galway), have developed and implemented a 'personalised' patient-centred cancer exercise programme [Can-React] based on international guidelines. This programme was launched in 2019 and the first cohort consisting of 36 post-treatment breast

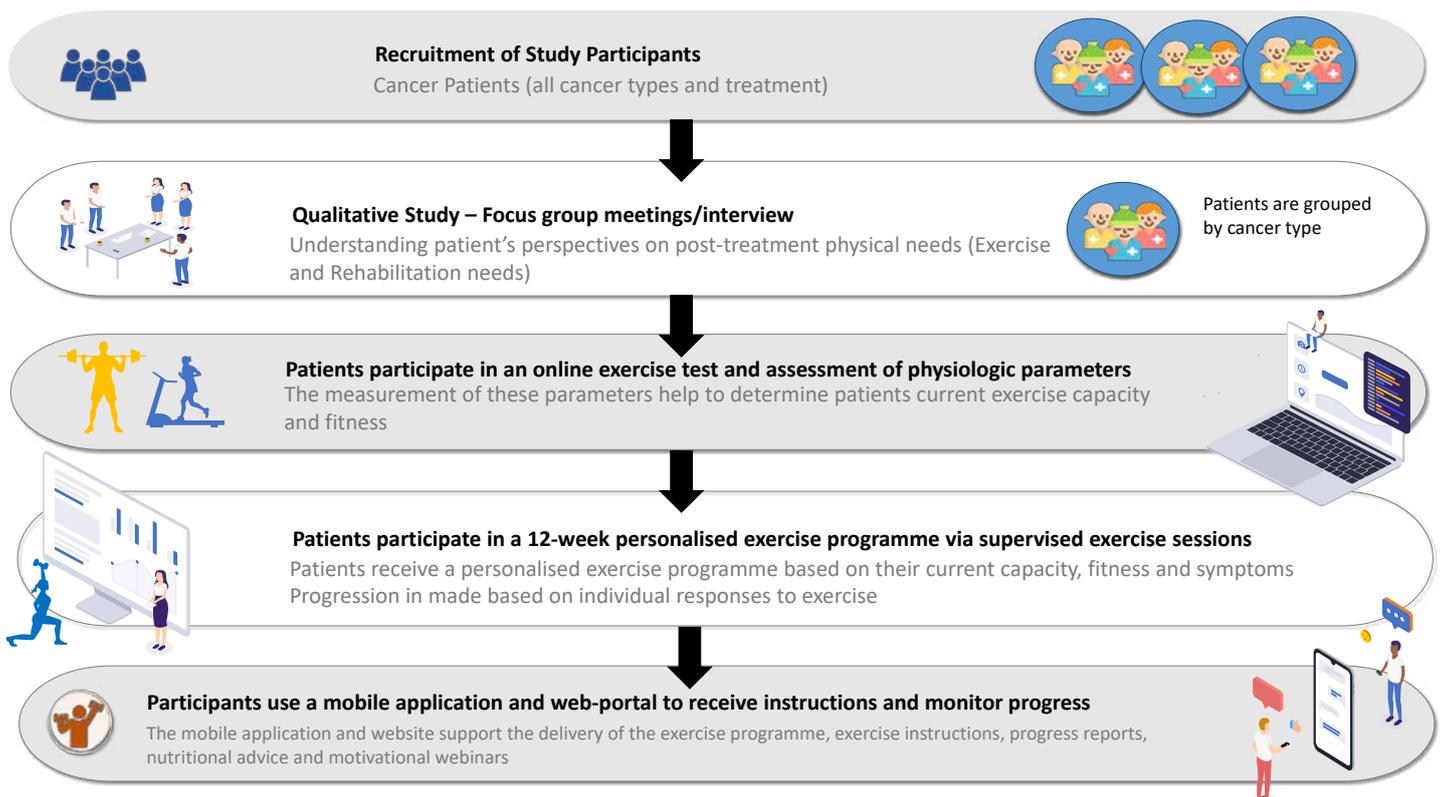
cancer patients participated in it. All the participants reported significant improvements in physical function and reduction in fatigue. All participants showed significant improvements in outcome measures, including cardiorespiratory fitness and muscle strength, balance, flexibility, mobility, reduced fatigue, and anxiety. All participants reported improved HRQoL, evaluated using a standard HRQoL questionnaire and scoring system.

In 2020 the ongoing coronavirus-disease pandemic (COVID-19) led to restrictions being imposed to prevent the spread of the SARS-Cov2 virus. These significantly disrupted cancer support services including the delivery of the Can-React exercise programme on NUI Galway campus. Cancer patients receiving or recovering from treatment are at high risk of COVID-19 infection-related

Figure 1: The Can-React Pathway: Diagrammatic representation of the Can-React patient care pathway.

The programme includes an online assessment followed by a personalised exercise prescription. The programme aims to deliver the exercise programme via video chat and online instructions so that patients can attend from the safety of their home. The exercise programme includes a personalised exercise programme based on individual's current exercise capacity and symptoms. This consists of appropriate combination of aerobic, resistance and flexibility training and is supported by nutritional advice and motivational support aimed to increase functional capacity and health-related quality of life (HRQoL). The diagram shows the progress made by participants after signing up for the programme: baseline assessment, exercise prescription, exercise monitoring, exercise progression and adaption.

Can-React an "at-home" Personalised Exercise-Rehabilitation Programme for Cancer Survivors



The Can-React 'Personalised' Exercise Programme significantly improves patient's Cardiorespiratory fitness and Muscle Strength

- **Reduces Pain and Fatigue**
- **Improves Flexibility and Balance**
- **Improves Muscle strength**
- **Improves Cardio-Respiratory fitness (CRF)**
- **Improves Health Related Quality of Life (HRQoL)**

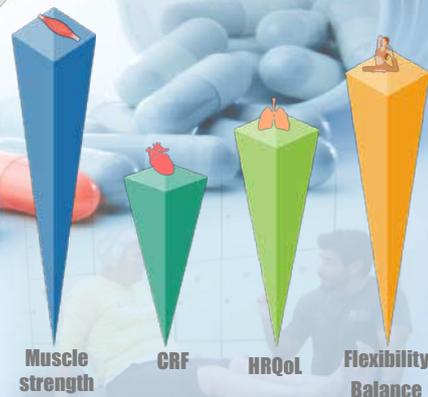


Figure 2: The Promising Results, The diagram represents the relative improvements seen in physiologic parameters amongst participants taking part in the Can-react at-home exercise programme.

morbidity and mortality and must self-isolate. This further impairs participation in physical activity essential to maintain health-related-fitness (HRF) and to manage side-effects of chronic disease. There is a need to develop alternative strategies to provide patient care without increasing the health risk. Home-based exercise provides an alternative for cancer survivors, that can overcome various accessibility hurdles. Of late delivery of "at-home" exercise interventions have become feasible, utilizing virtual platforms to deliver supervised exercise sessions and consultations. Recent investigations of "at-home" interventions have shown evidence of both safety and efficacy. Particularly during the current COVID-19 pandemic, such an alternative model of remote access is crucial for long-term support of cancer survivors.

Based on the preliminary face-to-face pilot study, Dr Gupta's team of researchers at NUI Galway developed the can-react programme into an "at-home" personalised exercise programme for improving physical function and HRQoL in cancer survivors (<https://www.nuigalway.ie/can-react/>). This program involves an online assessment of patients' health-related fitness, based on which the patient receives a personalised exercise programme consisting of aerobic, resistance and flexibility exercises aiming to improve cardiorespiratory capacity, muscle strength and range of motion and reduce cancer fatigue. The exercise programme is delivered through supervised one-to-one weekly online sessions for 12 weeks. The participants are assessed at regular intervals and the exercise

intensity, type and duration are adapted based on the progress made (Figure 1). The efficacy and feasibility of this programme was evaluated in a preliminary study which concluded in December 2021. There were two cohorts consisting of 56 cancer patients recovering from mainly breast, ovarian, blood and colon cancer who participated in this programme from May to December 2021. These patients were located across Ireland and were able to take part in the programme remotely from their home. Patients wishing to participate in on campus evaluation and exercise were facilitated to do so. Of the 56 patients who completed the initial programme many have enrolled in an advance exercise programme for further 12 weeks. The programme showed significant improvements in patients cardiorespiratory fitness, muscle strength, flexibility and balance. The regular exercise as a part of Can-React helped to reduce pain and fatigue. Patients reported "sleeping better and feeling better".

Patients participating in the Can-React programme showed significant improvements in all aspects of their physical function evaluated (Figure 2). The most significant improvement was seen in muscle strength and flexibility. Patients also reported reduced pain and fatigue. The quality of life was assessed using a standard questionnaire and showed a marked improvement in HRQoL. The feedback received from patients highlighted the importance of the exercise programme being personalised. Each participant is different and responds differently to disease and treatment. Therefore a "personalised" programme

that assessed the individual's needs, current side-effects and is adapted to their functional capacity and level of fitness was most beneficial. Also the programme was flexible and patients could progress based on the improvements made. This made it possible for patients to start slow and low without the fear of injury and progress at a level and pace that best suited them. Despite being online the weekly supervised sessions were a great source of motivation. The video instructions, personalised exercise brochures and other tools provided online and via emails was a useful guidance for patients to be exercising on their own at-home. The exercise physiologist was always available to answer questions and provide personalised support to the participants. This was a crucial aspect of the personalised program, as it allowed participants who may previously have been inactive, or have reduced activity due to treatment and disease side effects to regain confidence and motivation from achieving their "individualised" exercise target.

Dr Gupta and team found that home-based exercise interventions can be "equally effective" when compared with face-to-face interventions, if delivery is supported by proper technology and communication. "Tele-rehabilitation" is a remote access monitoring system which includes telephone calls, text messages, mobile-health or smartphone based applications, web-based platforms, and video-conferencing. Although these interventions are becoming more widely explored in health care, their quality and effectiveness in exercise oncology, in supporting a

home-based exercise programme, is not known. Can-react programme also evaluated the effectiveness of using currently available technology to deliver the various components of the exercise programme and to monitor progress made by participants remotely. Based on the feedback received from patients the NUI Galway team is currently developing a web-based application which in addition to delivery of the exercise intervention will also provide patients with information and resources for the better management of long-term side-effects of cancer treatment.

The number of patients 'living with and beyond' cancer have increased significantly. While earlier detection and availability of targeted therapy has improved survival and longevity, it has led to the emergence of long-term effects of the disease leading to poor HRQoL. The ongoing COVID-19 pandemic has affected the delivery of cancer support through traditional in person services. The Can-React programme has demonstrated that a home-based personalised program for patients with cancer while maintaining the benefits of targeted and high-fidelity exercise medicine is both effective and feasible in the given circumstances.

In the words of a patient advocate and participant: "The personalised approach of the Can-React programme provided me with the timely support and guidance needed to perform exercise safely. I feel the benefits in my daily life, I feel I have more energy to do my day to day chores."