

# Moving beyond exercise oncology rehabilitation

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## Impact paragraph

Cancer and its treatment can cause detrimental side effects like impaired physical fitness, mental distress, and chronic fatigue, leading to high healthcare consumption, decreased participation in social activities, and difficulties with returning to work.<sup>1</sup> The increased incidence and improved survival rates of cancer have resulted in a growing population of people living with and beyond cancer (hereafter: cancer survivors) and thereby an increase in societal and financial burden.<sup>2</sup> The long-standing, complex health issues that cancer survivors are often confronted with, should be addressed with adequate survivorship care, aiming to improve outcomes for the individual patient, but also to decrease the societal and economic burden.<sup>1,3,4</sup> The Maastricht Comprehensive Cancer Centre (MCCC) aims to provide the best possible oncological care and improve health in the region through the integration of healthcare, scientific research, and education, with a strong focus on ‘survival with preservation of function’.<sup>5</sup> Because of the increasing pressure on the Dutch healthcare system, the Integrated Healthcare Agreement (in Dutch Integraal Zorgakkoord; IZA) was formulated and published in 2022 as a call for action.<sup>6</sup> The IZA aims to provide “the right care and support, together with the patient, in the right place and with a focus on health instead of disease”. In this thesis, we reported on research findings about physical fitness and patient-reported outcomes during and beyond a supervised exercise program as part of multidisciplinary oncology rehabilitation. Multidisciplinary rehabilitation consists of exercise training, supplemented by other interventions aiming to improve mental health, chronic fatigue, work reintegration, and nutritional status. In this impact section, we will reflect on the scientific and societal impact of the study results presented by putting this in perspective of the vision of the MCCC and IZA. This was reported according to the Maastricht University Medical Centre (MUMC+) Circle of Innovation, which was developed to stimulate researchers and clinicians to promote healthy living in the region, by accumulating knowledge, innovating healthcare, and creating value for the patient by putting it into practice.

## Generating knowledge

This thesis contributed to the body of scientific evidence on multidisciplinary oncology rehabilitation. Results suggested that cancer survivors with interrelated physical and psychosocial complaints have significant and clinically relevant improvements in physical fitness and patient-reported outcomes after participating in a supervised 10-week exercise program, as part of multidisciplinary rehabilitation at the MUMC+. Moreover, findings implicated that higher exercise volumes lead to larger improvements in physical fitness in these patients. The collected data could serve as a reference for other researchers and clinicians since there is not much literature on cancer survivors with interrelated physical and psychosocial complaints.

Another study in this thesis on the effectiveness of remote coaching following supervised exercise rehabilitation has led to novel findings on the long-term outcomes of the exercise program. The results indicated that levels of aerobic capacity remained below normative values at the end of the exercise program and even six months after completion. The potential contribution of telehealth to optimise the sustainability of benefits gained during supervised exercise programs was explored, but a remote coaching intervention was not effective. The transition from supervised rehabilitation to independent physical activity (PA) and the role of remote coaching interventions during this period was also explored from the 'patient perspective' during interviews. These interviews revealed that remote coaching following a supervised exercise program was perceived acceptable to cancer survivors because it stimulated PA maintenance by offering a source of structure, social support, accountability, and confidence. The remote nature of the intervention was perceived as convenient by some of the participants, while others would have preferred additional physical appointments. The ability to maintain PA beyond supervised rehabilitation was related to the level of self-efficacy (i.e. people's belief in their capabilities for performing PA), PA habits, feeling of accountability, physical complaints, and accessibility of PA facilities.

Finally, findings on the usefulness of a practical performance test and self-reported questionnaires to monitor aerobic capacity in cancer survivors were reported. Aerobic capacity is seen as an important component of

physical fitness, reflecting the integrative function of the cardiovascular system, lungs, and muscles, and is therefore considered a 'clinical vital sign' and a good reflection of overall body health. The cardiopulmonary exercise test (CPET) is known as the best available measurement tool to assess aerobic capacity, but is not always feasible because expensive, advanced equipment and medical supervision are required. Moderate agreement between the aerobic capacity measured during a CPET and estimated using the FitMáx®-questionnaire (FitMáx), indicated that this questionnaire is a promising tool to get global insight into aerobic capacity. While a strong correlation between peak work rate achieved during the Steep Ramp test (SRT) and aerobic capacity measured during CPET, suggests that the SRT is suitable as a practical performance test to monitor aerobic capacity during exercise rehabilitation.

In order to have an impact, the knowledge generated during this thesis was also disseminated to researchers and clinicians. Research results have been submitted for publication in open-access, scientific peer-reviewed journals and presented at Dutch and international research conferences. Additionally, findings were shared and discussed with research and physical therapy trainees, and with clinicians, aiming for a direct impact on clinical practice. Moreover, this thesis has led to recommendations for future research in the field of exercise oncology rehabilitation; i.e. improving cancer survivorship delivery, selecting the right patients, choosing the right interventions, and investigating the effectiveness of cancer survivorship care on costs and outcomes at the healthcare services level.

Findings on the usefulness of the SRT to monitor aerobic capacity in cancer survivors were published in the 'Fysiopraxis', which is a Dutch trade journal for physical therapists. Results about the use of the FitMáx to measure aerobic capacity in cancer survivors were shared during a presentation and panel discussion as part of training for members of a national oncology physical therapy network (OncoNet). Research results were also presented and discussed in meetings of the working group 'Oncology Rehabilitation' of the oncology network of the South-East part of the Netherlands (OncoZon).

## Innovating healthcare and creating value

The knowledge generated in this thesis has already led to some healthcare innovations as well. Some of these innovations have already been implemented in daily practice, thereby creating value for the cancer survivors involved. For some innovations, follow-up research is required, and/or implementation is still ongoing. Therefore, these two steps of the innovation circle were not always distinct and were described combined.

Standard operating procedures and protocols on the measurement procedures and the execution of the exercise program of the usual care multidisciplinary oncology rehabilitation developed at the start of this PhD project have led to improved agreement and consistency in the process, conduct, and reporting of the exercise program. During the COVID-19 pandemic, the limited accessibility of the onsite rehabilitation program led to a shift in focus towards patients' self-management to PA in their home environment. We developed a home-based resistance exercise training program for the participants in our studies, which is now openly accessible on the website of the MUMC+. However, more research is needed on the implementation of this home-based exercise program.

At the start of this PhD project, a CPET was conducted in all patients before and after the exercise program at the MUMC+. As the short and approachable steep ramp test (SRT) turned out to be able to measure aerobic capacity and detect improvements over time when using a cutoff value, this test is now used to monitor aerobic capacity, while a CPET is performed only before the start of the program, to screen for cardiovascular risk as recommended in the Dutch Rehabilitation Guidelines.<sup>8</sup> The FitMáx which showed to be valid to estimate aerobic capacity has been implemented in pre-operative risk screening in patients with cancer awaiting abdominal surgery.

The study on the effectiveness of remote coaching following supervised rehabilitation has led to increased attention for long-term PA maintenance at MUMC+. The collaboration with local sports organisation Maastricht Sport and the implementation of their coaching program was initiated during the study and is continued after the completion of the study, despite the null results of the trial in **Chapter 3**. We are currently referring cancer survivors to

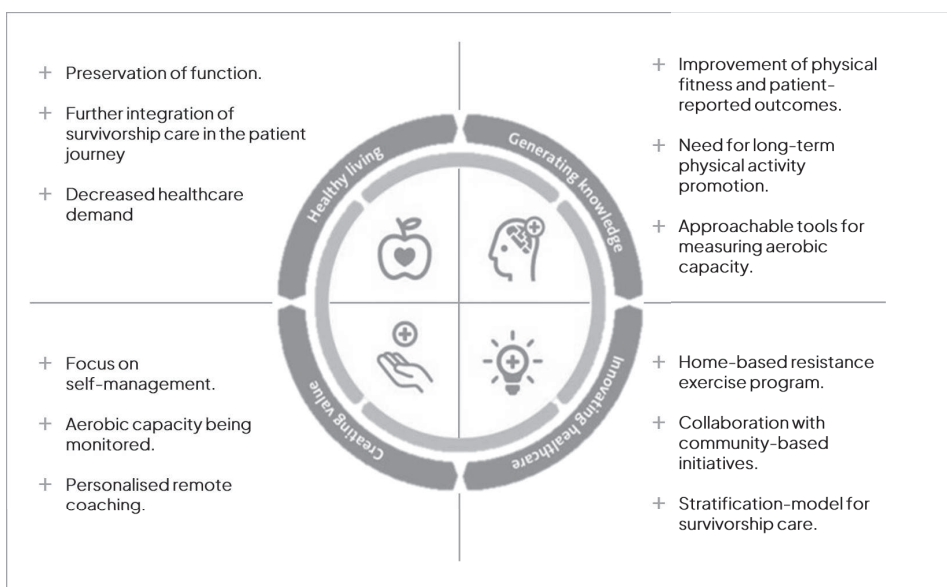
Maastricht Sport after the supervised exercise oncology program when they feel unconfident about independent exercise beyond the program and are seeking help with choosing a suitable type of PA. We believe that the remote coaching following supervised exercise oncology rehabilitation could be effective if only survivors in need would be targeted, but more research is needed to prove this. The interviews in **Chapter 4** revealed that cancer survivors appreciated the remote coaching intervention and perceived it to be helpful to stimulate PA maintenance. While the intervention intensity and frequency were consistent in all participants during the study, this is more personalised in practice nowadays. Some cancer survivors receive advice only once, to explore the exercise possibilities provided by Maastricht Sport, when they are not in need of long-term coaching but only need support to choose the exercise activity that suit them best. When patients are still severely impaired and are not capable to perform exercise independently, on the other hand, a coaching trajectory with more face-to-face appointments and physical guidance is possible as well, while these patients were excluded from participation in the study.

Based on the findings of this thesis combined with previous knowledge, a newly developed stratification model for survivorship care was proposed in **Chapter 7**. However, more research is needed to further develop this model and to investigate the effectiveness of this stratification method.

## Healthy living

Altogether, the results of this thesis have contributed to improving healthy living among cancer survivors by generating knowledge on the preservation of function and putting some of these findings into practice. We believe that further integration of cancer survivorship care in the continuum of cancer care would be valuable to the entire health system in the region, by preventing treatment complications, cancer progression and recurrence, and decreasing healthcare demand. Additionally, we think that improving the collaboration between oncology care and community-based initiatives could potentially have a societal impact in the future. It could reduce healthcare demand and costs, by improving lifestyle factors in cancer survivors without 'healthcare needs', thereby preventing disease

progression or recurrence and improving healthy living with preservation of function. Maastricht Sport is funded by the municipality of Maastricht and offers sports activities at no cost to improve the healthy living of inhabitants of the Maastricht region. This is in line with the vision of the IZA, which states that community-based initiatives should contribute to improving a healthy lifestyle, to keep healthcare accessible and affordable.<sup>6</sup> However, more research is needed in the future to stratify cancer survivors for the appropriate level of survivorship care and further investigate the effectiveness of collaboration with community-based initiatives like Maastricht Sport. Finally, we believe that the clinical implications suggested in this thesis can only be further put into practice in collaboration with stakeholders and decision-makers who are in a position to make implementation possible. The contribution of this thesis to each step of the MUMC+ innovation circle is summarised in Figure 1.



**Figure 1.** The findings and implications of this thesis summarised in the MUMC+ Circle of Innovation.

During this thesis, we generated and shared knowledge on cancer survivorship care, as the result of embedded research, meaning that there was a fine line between research and clinical practice. Subsequently, we innovated healthcare and created value by putting some of these

innovations into practice and providing implications and recommendations for the future. To finally conclude that we should move beyond exercise oncology rehabilitation to improve healthy living in cancer survivors along the continuum of cancer care.



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