Optimizing cancer care through e-health: status, potential, and adoption

Wessels-van Deursen, J.E.

Citation

Wessels-van Deursen, J. E. (2025, November 18). *Optimizing cancer care through e-health: status, potential, and adoption*. Retrieved from https://hdl.handle.net/1887/4283355

Version: Publisher's Version

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Note: To cite this publication please use the final published version (if applicable).

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Summary

Cancer is one of the most significant health issues in the Netherlands and globally. Both its prevalence and incidence are increasing, while survival rates are improving, causing cancer to be increasingly regarded as a chronic disease. People living with and after cancer often face symptoms and challenges related to the disease and its treatment, such as fatigue, anxiety, cognitive limitations, and social challenges. Many individuals do not always receive the care they need for these symptoms and challenges. Due to the rising number of diagnoses and increased survival rates, there is an increasing demand for cancer care and treatment, while healthcare capacity is under pressure, the workload for healthcare professionals is rising, and cancer-related healthcare costs continue to grow.

To make healthcare future-proof and improve care for cancer survivors, it is necessary to explore innovative solutions. One of the possible solutions is the integration of e-health technologies. E-health can improve care by enhancing the quality of care, improving healthcare efficiency, and promoting the engagement and empowerment of cancer survivors. However, there are also challenges, such as many e-health interventions being developed and tested but not yet integrated into regular care processes. Additionally, the uptake and adoption of e-health interventions are often low, with significant differences in use based on factors such as age, income, and education level. Further research is also needed on the effectiveness of existing e-health interventions for this target group.

The goal of this dissertation is to explore how cancer care can be optimized through the integration of e-health, based on three research questions:

1. What is the current scientific base for e-health interventions for Dutch cancer survivors?
2. What are the perspectives of cancer survivors and healthcare providers on the potential value of e-health in optimizing cancer care?
3. What factors are related to cancer survivors' uptake and adoption of e-health interventions?

Chapter 1, the introduction, outlines the background and objectives of this dissertation and the research questions. **Chapters 2 through 6** provide answers to the research questions and are discussed below. **Chapter 7** contains reflections on the results and methodology used in the studies, with suggestions for future research and practical applications.

A systematic review was conducted to address the first research question (current scientific base for e-health interventions), mapping out which types of interventions have been developed for Dutch cancer survivors (**Chapter 2**). The review describes the characteristics of e-health

interventions and the scientific evidence regarding their impact on population health, quality of care, and healthcare costs per capita.

The review identified 38 different interventions that have been scientifically studied, half of which focused on psychosocial challenges and complaints. Most interventions aimed at providing information or promoting self-management. Some interventions were specifically targeted at certain types of cancer or symptoms, but none were tailored to individual characteristics such as age, gender, or severity of the disease. Several interventions showed initial positive impacts on outcomes such as fatigue, physical activity, and sleep quality. Mixed effects were found for some outcomes, such as psychological symptoms and adjustment. No effects were found on smoking behavior, physical health, or health-related quality of life. The review highlighted several knowledge gaps, particularly the limited scientific research on economic evaluations and the broad accessibility of interventions.

To address the second research question (perspectives on the potential value of e-health) two qualitative studies were conducted with cancer survivors, healthcare providers, and managers. The goal was to explore their perspectives on the potential of e-health in optimizing colorectal cancer care in the Netherlands. The research focused on the insights of those who will use e-health in practice.

Chapter 3 presents a qualitative study of healthcare providers and managers working in colorectal cancer care. The study identified improvement opportunities in colorectal cancer care using e-health applications and explored how these could contribute to improving population health, quality of care, staff experiences, and reducing per capita healthcare costs. Seventeen healthcare providers and managers were interviewed, and twelve improvement opportunities were identified that applied to one or more phases of the colorectal cancer care pathway. **Chapter 4** presents a second qualitative study with cancer survivors, aiming to understand patients' perspectives on how colorectal cancer care could be improved and what role e-health might play in that process. Three focus groups were conducted with a total of sixteen participants.

Overall, participants had a positive view of using e-health to improve colorectal cancer care, though they acknowledged that it may not be suitable for everyone. The improvement opportunities mentioned focused on information provision, communication, and health monitoring. Examples include a digital intake that could replace a traditional physical intake for a colonoscopy, online information about treatment options, and a digital consultation hour. Cancer survivors emphasized the need for more guidance during aftercare, particularly around recovery and mental health. Both groups mentioned the need for better electronic data exchange. Healthcare professionals also suggested improvements for prehabilitation and shared decision-making, while cancer survivors proposed digital platforms for peer-to-peer support.

In answering the third research question (factors related to the uptake and adoption of e-health interventions), the focus was on a specific type of e-health, namely digital self-management programs for cancer survivors. **Chapter 5** describes a mixed-methods study examining what is needed to encourage the uptake and adoption of digital self-management programs and whether socio-demographic and clinical characteristics influence these needs. Fourteen cancer survivors who had completed cancer treatment were interviewed, and a questionnaire was distributed, which was completed by 213 individuals. Key factors identified included unfamiliarity with the programs, lack of information about the programs, reluctance or inability to pay for them, and the importance of programs being evidence-based and tailored to individual needs. Many patients also expressed a desire for digital contact with healthcare providers or a coach as part of the program. No differences were found in needs based on the socio-demographic or clinical variables studied.

Chapter 6 presents a quantitative study on the recently introduced OncoAppstore. The OncoAppstore is a digital platform offering evidence-based digital self-management and is accessible via the platform 'Kanker.nl'. It is designed for cancer survivors and their relatives. Users receive a digital credit of 100 euros to purchase programs. The study examined the use of the OncoAppstore and whether socio-demographic factors, clinical characteristics, income, and healthcare usage were associated with its use. Findings indicated that OncoAppstore users typically had higher education levels, higher incomes, were more often female, younger, and more frequently of Dutch origin than the general population of cancer survivors. Additionally, users had higher mental health care expenditures and lower pharmaceutical and general practitioner expenditures the year before diagnosis.

Chapter 7 reflects on the results and methodologies used, offering suggestions for future research and implications for practice and policy. It concludes that there are many e-health interventions available that are well-received by both healthcare professionals and cancer survivors. There is a clear need for digital aftercare programs to alleviate the symptoms of cancer survivors. However, usage remains limited, primarily due to a lack of awareness of availability and benefits. Additionally, differences persist between groups of cancer survivors in their use of e-health interventions. In particular, older adults and individuals with lower income and educational levels remain underrepresented, increasing the risk of unequal access to care. Furthermore, the funding and reimbursement of e-health remain unclear, hindering implementation. To promote broad adoption and successful implementation of e-health in cancer care, it is essential to raise awareness, ensure digital inclusivity, provide support programs for those who need help using digital tools, and foster effective collaboration between stakeholders. Additionally, policy changes are needed to better integrate e-health interventions into the healthcare system. It must also be carefully considered which types of care cannot be delivered digitally or for whom digital solutions may be less suitable to ensure no one is excluded from proper care. Finally, further research is needed on the cost-effectiveness of e-health interventions for cancer survivors compared to usual care and on effective ways to personalize these interventions.

Overall, this dissertation provides valuable insights for optimizing care for cancer survivors through e-health, aiming to improve access to care, promote health outcomes, and ensure the sustainability of care in the long term.