Cancer rehabilitation
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Cancer and cancer treatment may have serious effects on patients’ quality of life, not only during treatment but also years after the treatment has been completed. Adaptation to the cancer experience involves adjusting to a loss of functioning and requires patients to refocus on future plans and goals. The majority of cancer patients seem to cope effectively with the diagnosis and the cancer treatment [1]. However, a significant minority (c. 30%) experience so many continuing adjustment problems and a low quality of life [2] after cancer treatment that they may need professional support [3]. Cancer and cancer treatment are often associated with problems that are psychological (anxiety and depression), physical (impaired physical capacity, fatigue) and social (isolation, unemployment) in their nature. For patients with such persisting problems, supportive care interventions such as cancer rehabilitation programmes may be beneficial.

The present thesis deals with the subject: rehabilitation after cancer. This introductory chapter first provides a global description of the cancer problem and its extent [4]. Then the impact of the treatment on the quality of life, the need for rehabilitation, and the development of rehabilitation programmes for cancer patients are described. Finally, the model for the thesis is presented and the consequent goals are formulated.

Cancer, cancer treatment and rehabilitation

Cancer
Cancer is a general term for the abnormal, uncontrolled cell growth that leads to tissue failure unless the abnormal cells are removed or destroyed. Cancer is a common name for different diseases: tumours are named according to the tissue or organ of origin and the degree of differentiation. Cancer has the potential to spread, and the anatomic extent of the cancer, determined before definitive therapy, is expressed by the T NM staging: T = the local tumour size, N = the spread of the cancer to regional lymph nodes, and M = the presence or absence of distant metastasis. The T NM classification is translated into four stages (I to IV) representing the extent of the cancer. The higher the stage, the further the cancer has progressed and the worse the prognosis.

Cancer in the Netherlands
The data from the database of the Dutch Cancer Registry show the magnitude of the cancer problem in the Netherlands (see Box 1). The Dutch Cancer Registry is a population-based cancer registry, and involves a systematic collection of data on malignant neoplasms occurring in a geographically defined population. The data are collected by nine regional comprehensive cancer centres in collaboration with all Dutch hospitals [4].
Box 1
Cancer in the Netherlands

Incidence and prevalence
In 2003, 73,000 cases of cancer were diagnosed in the Netherlands, 37,500 in men and 35,500 in women. Of every 1000 men, 4.7 developed some form of cancer, against 4.4 of every 1000 women (crude rates). The total prevalence (= the total number of living cancer patients at a well-defined point in time) in the Netherlands is not known but is rated at 400,000 patients, which is about 2.5 percent of the Dutch population.

Most frequent types of cancer, gender and age
In 2003, breast cancer was the most common type (one third of all cases in females), with 11,800 new cases, followed by colorectal cancer (13 per cent of cancer in both sexes), lung cancer (18 per cent of all cases in males and 7 per cent in females), and prostate cancer (19 per cent of all cases in males). Other common types of cancer were cancer of the skin, bladder, lymphatic system, head and neck, uterus, and stomach.

Cancer is most common among the elderly; 40 per cent of all new cases were diagnosed in patients between 60 and 75 years old and 30 per cent was 75 years or older. Nine per cent of all new cancer patients were younger than 45 years.

Trends, mortality and survival rates
The overall number of registered malignant invasive tumours is rising by approximately 1000 tumours a year. This is due to population growth, an increasing number of older people, as well as effects of national cancer-screening procedures for breast and cervical cancer, early detection of prostate cancer, and improved diagnostic techniques and effective treatment.

Cancer is responsible for approximately 30% of deaths. Cancer is reported to be the primary cause of death for men and number two for women [5]. The survival rates of cancer patients vary and depend on the type of cancer and stage of disease. Globally, half of the cancer patients survive after cancer. The 5-year survival rate for breast cancer is 70-80%, for colorectal cancer 50-55%, for lung cancer 10-15% and for prostate cancer 50-60%.

Cancer treatment and related side effects
Depending on the type and the extent of the cancer, the morbidity and the choice of the patient, most cancer treatment is multidisciplinary and consists of surgery, radiotherapy, chemotherapy, hormonal therapy, or combined treatment modalities. Oncological guidelines are available on the internet (www.oncoline.nl).

Treatment-related side effects and symptoms are often the result of toxicities in multiple systems. Side effects include physical and psychological problems such as fatigue, lymphedema, decreased oxygen uptake, pain, body image problems, sleep disturbances, anxiety and depression, all potentially affecting the functioning of cancer patients.

Impact on the quality of life
Physical, psychological and social problems may occur in the short term, but problems are also reported to persist over time, and all have the potential to affect the overall quality of life of cancer patients [6]. Therefore, Health-Related Quality of Life (HRQoL) has become...
an increasingly important and frequently-examined outcome measure in oncology. In addition, HRQoL may be a predictor for mortality and morbidity [7] and improvement of quality of life has therefore become a main goal of supportive care in cancer patients.

HRQoL is a multidimensional construct incorporating at least three broad domains - physical, psychological and social functioning. Physical functioning is usually defined as the performance or the ability to perform a range of daily activities, as well as physical symptoms resulting either from the disease itself or from treatment. Psychological functioning ranges from severe psychological distress to a positive sense of well-being and may also encompass cognitive functioning. Social functioning refers to quantitative and qualitative aspects of social relationships and interactions, and social integration. Beyond these core domains, HRQoL measuring instruments include an overall judgement of patients regarding their health and quality of life [7].

Need for rehabilitation
A low quality of life after cancer may be associated with the need for supportive care, such as rehabilitation. The number of cancer patients that may need rehabilitation is expected to grow. An estimation about this target population, i.e., patients who have completed cancer treatment and have a life expectancy >1 year, and who continue to experience quality of life problems, indicates a population of 5000 rehabilitation candidates in the year 2000 and nearly 7000 patients in 2015 [8].

Rehabilitation and the ICF classification
The World Health Organisation (WHO) defines rehabilitation as a wide range of activities in addition to medical care, including physical, psychosocial and occupational therapy. It is a process aimed at enabling people with disabilities to reach and maintain their optimal physical, sensory, intellectual, psychological and/or social functional levels.

The WHO promotes the use of the International Classification of Functioning, Disability and Health (ICF), because of its help in facilitating the understanding and measurement of health outcomes (Figure 1, bold). The ICF describes how people live with their health condition. The ICF is a classification of health and health-related domains that describe body functions and structures, activities and participation. The domains are classified from body, individual and societal perspectives. Body functions are the physiological functions of body systems (including psychological functions). Impairments are problems in body functions such as deviation or loss. Activity is the execution of a task or action by an individual. Activity limitations are difficulties an individual may have in executing activities. Participation is involvement a life situation, and participation restrictions are problems an individual may experience in involvement in life situations. Functioning is an umbrella term encompassing all body functions, activities and participation. The ICF acknowledges that the functioning is affected by various factors. These factors include medical factors such as the disease and the consequent treatment, personal factors such as age, gender, personality, and external factors such as an individual physical and social context.

Application of the ICF classification in cancer
The ICF describes how people cope with their health status, which may also be helpful in the case of cancer. Figure 1 shows examples that may determine cancer patients’ functioning (Figure 1, italics). After cancer and cancer treatment, a loss of physiological or
psychological functions may occur, such as an impaired oxygen uptake, or psychological distress. Cancer patients may also experience limitations in the performance of certain activities such as walking, cycling, or making decisions. Cancer patients may further experience participation restrictions in visiting friends or in taking part in sports or in keeping employment. Some sociodemographic variables such as gender and age seem to be risk factors for adjustment. For example, women and younger patients seem to have more difficulty adapting to the disease than male and older patients do [9]. Furthermore, individuals may have internal and external resources that may help or hinder them in coping with cancer. Internal and external resources refer, for example, to self-efficacy [10] and the amount of social support that patients may perceive when confronted with cancer [11].

**Figure 1**

Interaction of the aspects of health status, functioning, and personal and external factors. *Italics: examples with cancer*

Rehabilitation programmes for cancer patients

Several interventions have been developed to improve the quality of life of cancer patients. Such interventions include psychological programmes and/or physical training programmes. Psychosocial interventions primarily focus on coping with the disease and reducing psychological symptoms such as anxiety and depression [12,13]. Physical training, i.e., exercise training programmes, are reported to be beneficial for cancer patients because they are aimed at improving functional capacity, muscle strength, and cancer-related fatigue which may, in turn, contribute to a better overall quality of life [14,15].

Multidimensional rehabilitation programmes that include both physical and psychological programmes were developed to overcome the multi-faceted problems facing cancer patients. These combined programmes were developed in the Scandinavian countries in the early 1990s [16]. Since 1995, the comprehensive cancer centres in the Netherlands have developed and implemented such combined programmes.
Despite the increasing number of patients and centres that have supplied multidimensional rehabilitation programmes up to the present, little is known about the effectiveness of such programmes. Therefore research is needed. The present dissertation is the first in the Netherlands to focus on the effectiveness of a multidimensional cancer rehabilitation programme on the quality of life.

**Model for the thesis and aims**

The model for the thesis is visualized in Figure 2 and represents the following train of thought. Cancer and cancer-treatment can be considered stressors to which an individual has to adapt. These stressors will have a direct effect on the quality of life or on the fatigue experienced by the patient. However, some patients seem to have a greater risk of experiencing problems while others seem to be able to adjust well. The risk or resistance factors may be sociodemographic (such as age, gender) or be related to internal and external resources. Furthermore, the model incorporates an intervention, a multidimensional rehabilitation programme, which will be delivered after the completion of cancer treatment to patients who continue to have quality of life problems [3]. The rehabilitation programme is assumed to have a directly beneficial effect on quality of life, but it may also affect internal and external resources through which a positive effect on outcome may subsequently be realized.

The aim of the present thesis is to examine the effect of a multidimensional rehabilitation programme on physical, psychological and social functioning, and on fatigue. Our second aim was to obtain insight into risk and resistance variables for the quality of life and for fatigue. After all, even up to the present, it is still not clear why some patients benefit from rehabilitation while others do not.

**Figure 2**

**Model for the thesis**
Overview of the thesis

The first part of the present thesis is based on a project performed by the Comprehensive Cancer Centre North Netherlands (CCCN) and Center for Rehabilitation of the University Medical Center Groningen. This project involved the development, implementation and delivery of a multidimensional rehabilitation programme during the period 1998-2001.

The second part of the present thesis is based on a multi-centre randomized controlled trial (RCT) that started in 2003 and was financially supported by the Dutch Cancer Society. This RCT (Oncorev) aims to examine the effect of a physical training programme on patients’ quality of life and on fatigue in comparison to the effect of a multidimensional rehabilitation programme and to no intervention (a waiting control group). For this RCT, a new physical training programme was developed. The development of this evidence-based self-management physical training programme will be presented in Chapter 6 of this thesis.

Chapter 2 reports on the short-term effects of the multidimensional cancer rehabilitation programme on physical functioning, fatigue, and quality of life.

Chapter 3 focuses on differences in the quality of life between cancer patients referred to the rehabilitation programme, a reference group of cancer patients, and the general population. The main goal is to examine the effect of the multidimensional rehabilitation programme on global and disease-specific health-related quality of life. Finally, investigation is performed into the differences between patients who chose to follow the entire rehabilitation programme and patients who chose certain components of the programme.

Chapter 4 deals with the examination of the effect of the cancer rehabilitation programme on social support (an external resource) and on self-efficacy (an internal resource). In addition, the chapter focuses on the effect of these personal resources on the quality of life before and after the programme, and on associations between change in quality of life and change in personal resources. Because fatigue is one of the most frequently-reported complaints of cancer patients and survivors, Chapter 5 focuses on fatigue and rehabilitation. First, the effect of the multidimensional rehabilitation programme on five domains of fatigue is examined. Second, the chapter explores several predictors of fatigue in patients referred to cancer rehabilitation. Finally, the chapter explores the association between change in fatigue after the programme and the change in the predictors of fatigue identified at baseline.

Chapter 6 describes the development of a self-management physical training programme, based on the best available evidence regarding the content and the delivery.

A general discussion and concluding remarks concerning the studies are presented in Chapter 7.

Chapter 8 summarizes the results of the studies in English and Dutch, respectively.
**Reference List**


