Ingvild Tømta

Physical activity in prostate cancer

- and the association to fatigue

Master thesis in Sport Sciences
Department of Coaching and Psycholgy
Norwegian School of Sport Sciences, |2011

Abstract

Aims: In the present study the aims were to examine the level of physical activity (PA) before diagnosis (retrospectively) and after treatment in prostate cancer survivors. Another aim was to examine changes in level of PA after treatment compared to before diagnosis. Further aims were to investigate the relationship between level of PA before diagnosis and occurrence of cancer-related fatigue after treatment, and the association between level of PA after ended treatment and cancer-related fatigue after treatment.

Methods: Three hundred and twenty-one prostate cancer survivors aged between 56 and 80 years (M = 68.5, SD = 5.24), and localized staged (T1-T3) were included in this cross-sectional study. They completed a questionnaire including question about demographic variables, physical activity and fatigue. Physical activity was assessed by Godin Leisure-Time Exercise Questionnaire at two moments of time (before diagnosis (retrospectively) and after treatment (at present time when filling out the questionnaire). Fatigue was assessed by Fatigue questionnaire.

Results: Fourty-five % completed the questionnaires. 41 % of the participants were physically active before diagnosis, whereas 44 % were physically active after treatment. 12 % was physically active before diagnosis but inactive after treatment, whereas 17 % were inactive before diagnosis and active after treatment. Being physically active before diagnosis was associated with lower fatigue post treatment ($p < .05$). Being physically active after treatment was also significantly associated with lower fatigue scores post treatment ($P<.05$).

Conclusion: Less than half of the prostate cancer survivors reported to be physically active both before diagnosis and after treatment. The majority had the same activity level at the same time points. Being physically active was associated with having less fatigue, both before diagnosis and after treatment.

KEY WORDS: prostate cancer, level of physical activity, fatigue

Forord

Årene på NIH har gått fort, og blitt flere enn opprinnelig planlagt. Tiden her oppe i skogkanten har vært god, og mange timer har vært tilbrakt inne på skolen og i de nærliggende områdene. Til slutt har dette resultert i en mastergrad, det siste skriveåret har vært spennende, utfordrende og utviklende, og mange har hjulpet på veien til endt produkt:

En stor takk til Nicolas Lemyre. Du har vært positiv, og delt av din enorme kunnskap på ditt spesialområde- utbrenthet. Samtidig har du både veiledet og utfordret, og jeg har lært utrolig mye om forskningsprosessen. Til slutt kom vi i mål!

En like stor takk til Lene Thorsen som allerede tidlig stilte som biveileder, og introduserte meg for prosjektet på Radiumhospitalet. Ditt utrolige engasjement er inspirerende og beundringsverdig. Du har hele tiden hjulpet meg i riktig retning, og jeg har alltid gått med et smil fra møtene med deg!

Gunhild Gjerset, enten høyt oppe i 8. etasje eller nede på bassengkanten på Radiumhospitalet. Takk for gjestfriheten, og god hjelp med statistikken. Ingen spørsmål var for dumme!

Personalet ved NIHs bibliotek fortjener en stor takk for all hjelp med å innhente viktig litteratur.

Ellers er det mange som skal ha et klapp på skulderen; ingen nevnt, dermed ingen glemt.

Oslo, Mai 2011

Ingvild Tømta

Table of contents

List of tables

List of figures

1. Introduction

The number of people living with a history of cancer both in Norway, and across the world is increasing every year (Cancer Registry of Norway, 2010). It is well documented that many of the survivors will experience severe side effects of the illness and treatment, both during and after treatment (Fossa, Giercksky, & Smeland, 2009). In light of these findings an entire new field of cancer research has been developed, focused on limiting the severity of side effects of treatments, and improving the overall quality of life among cancer survivors (Courneya, 2009). Cancer-related fatigue (CRF) is reported to be the most common and distressing side effect among cancer survivors, limiting and negatively influencing the survivors' quality of life (Courneya & Friedenreich, 1999; Mock, 2001). Researchers have been looking at a variety of methods to increase quality of life in cancer survivors. One non-invasive intervention that has shown great potential is the use of physical activity (PA). Both observational and experimental research findings have shown promising associations between PA during and after treatment and occurrence of CRF (Peddle, Au, & Courneya, 2008; Speck, Courneya, Masse, Duval, & Schmitz, 2010; Thorsen, Courneya, Stevinson, & Fossa, 2008). PA prior to diagnosis and treatment seems to be important, however few studies have looked at lifestyle prior to treatment and its influence on quality of life post treatment (Courneya, 2009). Prostate cancer (PC) is the most common diagnosis among men, with increasing incident rates (Cancer Registry of Norway, 2010). The number of studies concerning cancers in general, as well as PC in particular has been increasing during the last decades. In the present study the aims were to examine the level of PA before diagnosis (retrospectively) and after treatment in prostate cancer survivors, as well as investigate changes in level of PA between the two time points. Further aims were to investigate the association between level of PA before diagnosis and occurrence of CRF after treatment, and investigate the association between level of PA after ended treatment and occurrence of CRF in the same sample.

2. Background

2.1 Cancer

Cancer is a common diagnosis in the western part of the world, and the most frequent cause of death in the Norwegian population below the age of 80 years old (Statistisk sentralbyrå, 2005). In 2008, 26 121 new cancer cases were detected in Norway (Cancer Registry of Norway, 2010). Earlier detection together with advanced treatments improve the cancer survival prognosis, and approximately 60 % of patients treated for cancer are alive five years after ended treatment (Cancer Registry of Norway, 2010). The population of people living with a history of cancer is growing, and the number reached almost 190 000 cancer survivors in Norway in 2008 (Cancer Registry of Norway, 2010), and 25 millions worldwide (World Health Organization, 2010).

Cancer is a complex disease that includes more than 100 different diagnoses. All of these occur because of disturbance in cells' actions. Typically the cells growth becomes unpredictable and new abnormal cells are created. Together, these cells can create tumors in one organ, an organ system or spread out to the whole organism (Andersen, 2000). Tumors in prostate, breast, colorectal and lung tissues are the most common cancer diagnoses, and these four diagnoses represent almost half of the total detected cancer cases (Cancer Registry of Norway, 2010). The etiology of cancer is still not wholly understood. However, age, genetics, environment and lifestyle are all factors that seems to influence its occurrence (Møller & Langmark, 2009; Tretli.S., 2000b). Accordingly, aging is associated with higher risks, and as so 73 % of Norwegian cancer patients are older than 60 years when diagnosed (Møller & Langmark, 2009). Genetics have also been identified as playing an important role, and can explain why cancer occurs more frequently in some families than others (Tretli.S., 2000b). Environment factors such as special conditions at work or in a person's daily environment (e.g. radiation, chemicals or radon) are believed to increase cancer risk (Tretli.S., 2000b). Smoking, unhealthy diet and inactivity are well documented lifestyle factors associated with increased risk of cancer, and it is proposed that two out of three cancer cases can be associated to lifestyle characteristics (Tretli.S., 2000b). Thus, in high-income countries, age, environment

factors and lifestyle have been identified as the three major causes for cancer (Cancer Registry of Norway, 2010; World Health Organization, 2010).

2.1.1 Treatment and side effects

The broad variety of cancer diagnoses and their distinct development require a range of treatments. The three most common treatment regimes are surgery, radiotherapy and systematic therapy (chemotherapy, hormone therapy and immune therapy). They can be given separately or in combination (Fossa et al., 2009). Treatment is aimed either to give total cure (*curative*), or to limit further development, increase life expectancy and improve quality of life in the remaining years (*palliative)* (Fossa et al., 2009). Because cancer cells can live for a long time, behave differently, have low sensitivity for medicines and have various effects depending on the individual, it can be challenging to fight them (Lewitt, Guralnick, Kagan, & Gilbert, 1980). Cancer and its treatment can cause both acute and long-lasting side effects, which can lead to a decreased physical function and reduced quality of life (Fossa, 2009). An early detection and immediate onset of optimal treatment will promote the survival rate, and reduce the severity of side effects (Brenhovd, 2011).

2.2 Prostate cancer

2.2.1 Prevalence

PC is the most common cancer diagnosis among males in North-America and Europe (World Health Organization, 2010). In 2008, 4168 new cases were detected in Norway (Cancer Registry of Norway, 2010). The five-year relative survival rate is 85 % (Cancer Registry of Norway, 2010). This good prognosis is likely caused by improved detection instruments, a better understanding of the disease and more advanced treatments. A blood-test of a specific prostate antigen (PSA) can detect PC early in its development process (Brenhovd, 2011), this promote cancer survival (Godley, 1999). Because of improved detection instruments and an aging population in Norway, an increased number of men have been diagnosed and treated for PC (Godley, 1999).

2.2.2 Risk factors and development of prostate cancer

The prostate is a relatively small sized gland located in front of the rectum and under the bladder in males. The causes for the development of PC is still not completely explained, but age, genetics, lifestyle, as well as hormones, diet, and environmental

factors are suggested to influence its occurrence (Brenhovd, 2011). Studies have shown that aging and incidence of the disease in other family members are the most common risk factors (Brawley, Knopf, & Thompson, 1998). Approximately 80 % of PC diagnoses occur in men over 65 years (Cancer Registry of Norway, 2010). Few cases are detected before the age of 45 (Iversen & Berge, 2010).

A tumor occurring in the prostate is usually slow-growing, and often staged localized (Iversen & Berge, 2010). Early symptoms can be frequent urination, followed by back and skeleton pain. Neurological symptoms are usual, while fatigue and weight loss also occur frequently (Brenhovd, 2011). The development of PC can be described in stages (figure 1); Tumor stage 1 (T1) is known as localized PC. There is minimal progression and few symptoms. The tumor is small and placed inside the prostate gland. In tumor stage 2 (T2) the tumor is still local within the prostate gland, but it has grown larger, and can be detected during a rectal exam or ultrasound (Brenhovd, 2011).

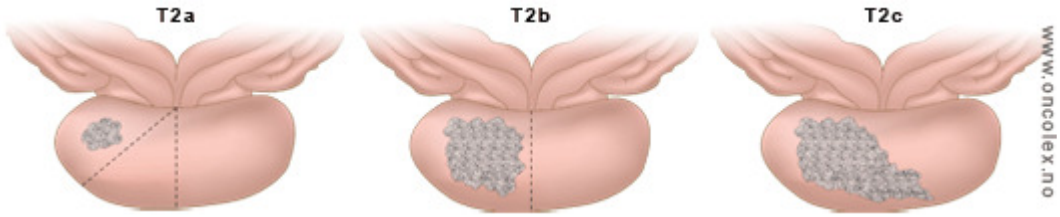

Figure 1: *Development stage of prostate cancer (T2) (Brenhovd, 2011)*

Tumor stage 3 (T3) is called locally advanced PC. The tumor has grown through the prostatic capsule (figure 2), and involves some of the seminal vesicles (Brenhovd, 2011).

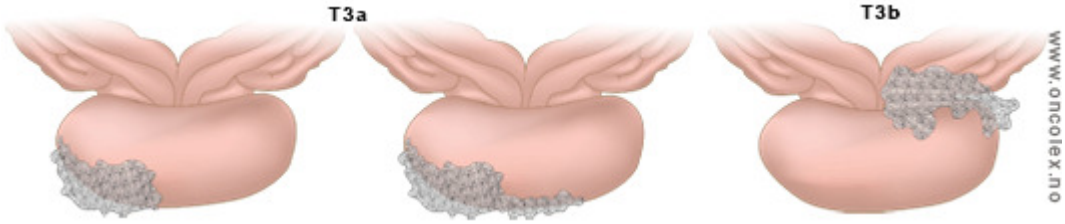

Figure 2: *Development stage of prostate cancer (T3) (Brenhovd, 2011)*

When developed to tumor stage 4 (T4) the tumor has invaded other nearby structures (the bladder, rectum and the wall of the pelvis) (figure 3) (Brenhovd, 2011)

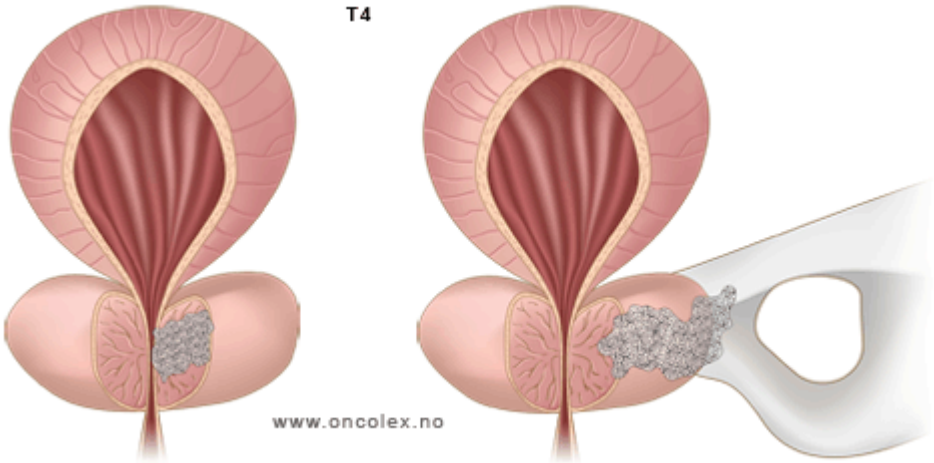

Figure 3: *Development stage of prostate cancer (T4) (Brenhovd, 2011)*

A further growth of the tumor and development to the lymph nodes is called stage N. If the cancer cells spread out to other tissues and organs in the body, then it has developed to metastatic cancer. This form of cancer is harder to treat, and the prognosis for total cure is weakened (Brenhovd, 2011).

2.2.3 Treatment and side effects

PC surgery, radiotherapy and hormone therapy are the three most common treatments (Iversen & Berge, 2010). Development stage, progression of the tumor, patient's age, general health, associated side effects, cancer history and patient's evaluations are all factors that affects the choice of treatment (Brenhovd, 2011; Fossa et al., 2009). "Watchful waiting" is an active standpoint to wait with treatment until it is required, during which frequent controls are needed (Heidenreich et al., 2009). *Surgery* typically removes the whole or some parts of the tumor, and is most appropriate in localized (< T2) tumors (Klepp, 2000; Brenhovd, 2011). *Radiotherapy* is used with intention to kill the cancer cells in localized cases (≤ 2). Normally 35 doses are needed to effectively treat PC (Klepp, 2000). *Hormone therapy (i.e. androgen deprivation therapy)* is typically used to restrain growth and reduce tumor size, and can be used in all development stages (often prior or in addition to other treatments). Injections are often received in intervals of one to three months, over a period of six months to two years (Brenhovd, 2011).

With this wide range of treatments, the overall prognosis of surviving PC is good (Penson & Chan, 2007), and the majority of PC survivors are expected to live for at least 10 years (Cancer Registry of Norway, 2010). However, many survivors will have to live with severe side effects (Brenhovd, 2011; Fossa et al., 2009). Incontinence and impotence are common side effects after *surgery* (Klepp, 2000; Brenhovd, 2011). Decreased local sensitivity, frequent urination, blood in the urine and impotence are some of the side effects associated with *radiotherapy* for PC (Klepp, 2000). In a study investigating fatigue, quality of life and physical fitness in a group of PC patients receiving radiotherapy 80 % of the members reported CRF, and 30 % of the group experienced CRF chronically (Segal et al., 2009). Reduction in testosterone level in relationship to *hormone therapy (i.e. androgen deprivation therapy)* can cause limitations in sexual functioning, heat flashes, increased weight, reduced muscle mass and strength, as well as increased risk of osteoporosis (Fossa, 2009). CRF has been identified as an serious common negative side effect to all cancer treatments (Schmitz et al., 2010).

2.3 Fatigue

It is normal to feel an occasional lack of energy, some bouts of tiredness, as well as feeling exhausted or sick, but with rest and sleep these feelings usually disappear (Strauss, 2006). However, in some cases exhaustion is long lasting and a general state of fatigue is developed. *"Fatigue is defined as a subjective experience of being tired and/or worn out, both mentally and/or physically"* (Wessely, 1998). *Physical fatigue* is the feeling of being physically worn out, while *mental fatigue* influences memory, concentration and attention (Loge, 2009). If the fatigue extends and constrains the patients' functional capacity for more than six months, it is categorized as chronic fatigue (Avellaneda et al., 2009). In the general Norwegian population 9 % of men, and 12 % of woman experience chronic fatigue (Loge, Abrahamsen, Ekeberg, & Kaasa, 1999). Other studies reported that between 11 % and 45 % of the general population can be categorized as chronic fatigue (Chen, 1986; Lewis & Wessely, 1992; Loge, Ekeberg, & Kaasa, 1998). It is important to distinguish between fatigue related to illnesses (e.g. cancer), and fatigue occurring without a medical condition diagnosed (Loge, 2009).

2.3.1 Cancer-related fatigue and prevalence

Cancer survivors report cancer-related fatigue (CRF) as the most common and distressing side effect during and after cancer treatment (Cramp & Daniel, 2008; Loge, 2009). CRF has been defined as *"a persistent, subjective sense of tiredness related directly to cancer or cancer treatments that interferes with usual functioning"* (Mock, 2003, p. 310). CRF can occur in all stages of the illness. It can represent a warning symptom before diagnosis, during the illness, or as a side effect associated with treatment (Loge, 2009). Experimental evidence shows that CRF occurs with dose-density and dose-intensity relationships of treatment; more comprehensive and long-lasting treatments have been linked to higher level of reported CRF (Mock, 2001). The occurrence of chronic fatigue was 25-30 % in a group of Hodgkin's disease survivors (Loge et al., 1999). CRF is common and reported in up to 80 % of patients during radiotherapy. Of these 30 % could be categorized as chronic cases (Jereczek-Fossa, Marsiflia, & Orecchia, 2002). Among a mixed cancer group (ages, cancer diagnoses, disease statuses) treated with chemotherapy 65 % reported greater levels of CRF (Adamsen et al., 2009). 70 % of the patients undergoing radiotherapy, chemotherapy or surgery reported to experience fatigue (Dimeo, 2001). In patients receiving cyclic treatments, CRF often occurs with a peak few days after treatment and declines until the next treatment cycle (Portenoy & Itri, 1999). CRF can cause changes and limitations in normal daily activities and decrease the quality of life (Nail, Jones, Greene, Schipper, & Jensen, 1991; Courneya & Friedenreich, 1999).

CRF has been classified as an official diagnosis in the International Classification of Disease since 1998. To be diagnosed, a minimum six of the 14 fatigue symptoms need to occur on an almost daily basis, during a 2-week period, in the past month (Cella, Peterman, Passik, Jacobsen, & Breitbart, 1998).

Etiology of cancer-related fatigue

Research explaining the underlying mechanism of CRF is limited, and the suggested etiology is complex and debated (Gutstein, 2001; Hofman, Ryan, Figueroa-Moseley, Jean-Pierre, & Morrow, 2007). Figure 4 demonstrates commonly identified causes, a combination of physical, psychological and situational components: as a direct consequence of the cancer, treatment, in addition to the psychosocial burden of

having to cope with a chronic illness, exacerbating comorbid symptoms or medical conditions (Cella, 1998; Portenoy & Itri, 1999). Developmental stage of a tumor is believed to affect both prevalence and severity of CRF, and the length of the CRF experience increases with more advanced disease stage and treatment length (Glaus, 1998; Mock, 2001).

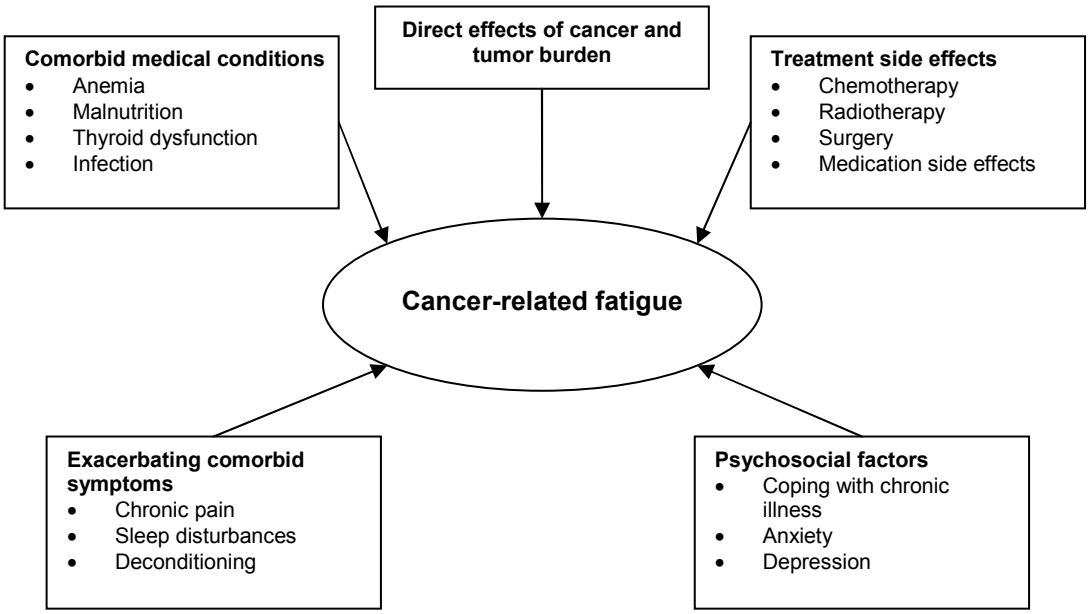

Figure 4: *Causes of cancer-related fatigue (Cella, 1998; Portenoy & Itri, 1999).*

A consequence of cancer and its treatment might be immobility and inactivity. This can lead to a decrease in physical fitness and lower the ability to fulfill normal daily activities. An increased expenditure of energy for basic life activities is likely to promote CRF (figure 5) (Lucia, Earnest, & Perez, 2003). An expert panel from The National Comprehensive Cancer Network add reduced level of PA as an explanation to occurrence of CRF (Mock, 2001).

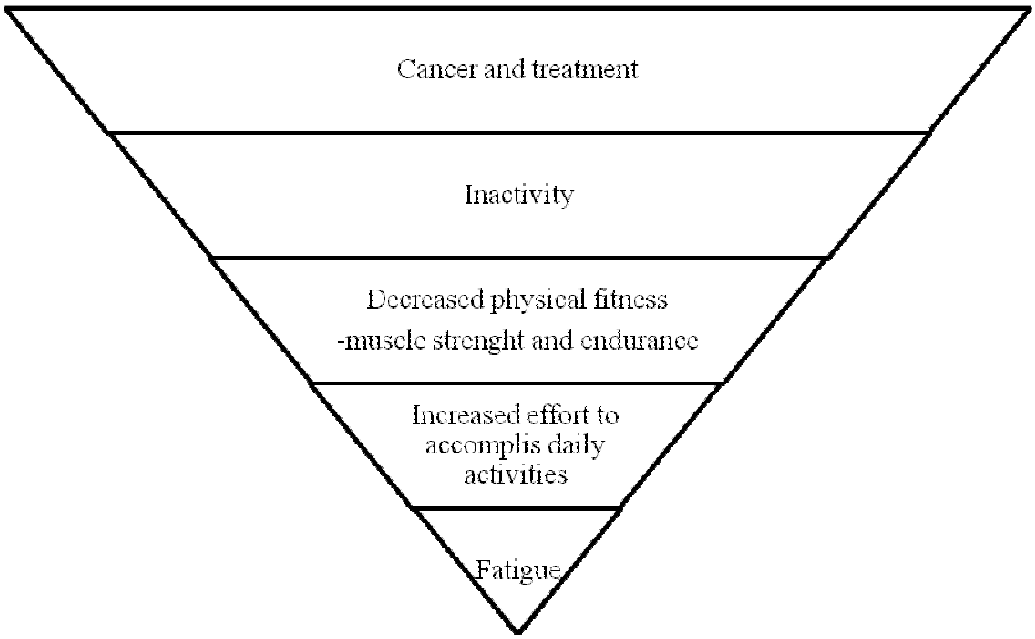

Figure 5: *Mechanism: Inactivity and cancer-related fatigue (Cramp & Daniel, 2008)*

2.3.2 Management strategies

The amount of research aiming to reduce the extension of CRF has increased in the past decades (Conn, Hafdahl, Porock, McDaniel, & Nielsen, 2006; Wagner & Cella, 2004). Three main strategies has been identified focused and recommended: PA, psychosocial treatment and medical treatment (National Comprehensive Cancer Network, 2006). Interventions without drugs are often preferred because they may have less negative side effects (Loge, 2009).

Historically, patients have been advised to rest and relax to recover their strength and reduce the extent of CRF (Lucia et al., 2003; Vogelzang et al., 1997; Thune & Smeland, 2000b). In a study by Stone the authors reported that only 4 % of patients had been advised to be physically active (Stone, 2002). Recent research findings support the benefits of PA, both during and after treatment. Consequently it is more common for patients to be advised to maintain or increase PA levels as a form of treatment to reduce CRF (Speck et al., 2010; Schmitz et al., 2005; Spence, Heesch, & Brown, 2010; Cramp & Daniel, 2008; Mock & Olsen, 2003). A vicious circle of inactivity and impairment may explain that lack of PA is a risk factor for fatigue, and sedentary habits can increase the likelihood of fatigue becoming a chronic condition. This can be used as framework to identify the bases for interventions including PA to reduce CRF (Chen, 1986; Mock, 2001). An increased physical capacity will reduce

the amount of energy used to perform equivalent activities, and avoid a self-perpetuated fatigue, thus only PA can break the cycle of fatigue (figure 6) (Lucia et al., 2003). It is also shown that regular PA increases endorphin production, mood states and sleep quality (Mock, 2001). These are associated to lower levels of CRF.

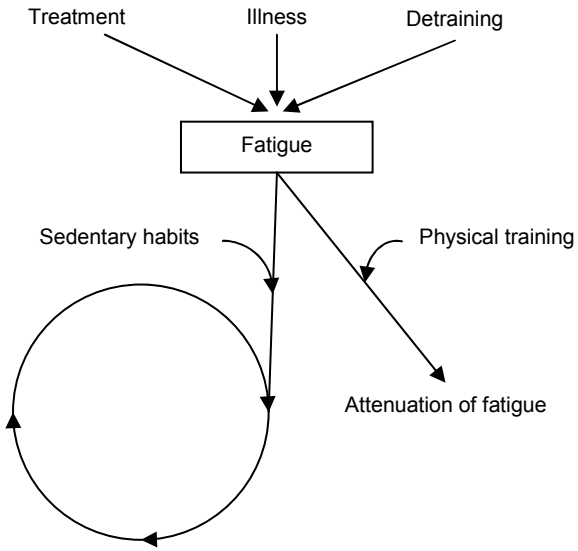

Figure 6: *Breaking out of self-perpetuating fatigue (Lucia et al., 2003)*

Improved physical functioning may be necessary to combat fatigue (Windsor, Nicol, & Potter, 2004). Appropriate educational work among the cancer survivors and their relatives is important to obtain and create motivation to be physically active after being hospitalized.

2.4 Physical activity

2.4.1 Definitions and benefits in general

Physical activity is defined as *"any bodily movement produced by the skeletal muscles that result in a substantial increase over resting energy expenditure. Under this broad concept, we need to consider leisure-time physical activity, exercise, sport, transportation, occupational work and chores"*(Bouchard, Blair, & Haskell, 2003, p.12) . Exercise is more specific " *it is physical activity performed in a systematically dosed manner (e.g. specific frequency, intensity, duration, and mode), and with intention of improving health-related outcomes (e.g. cardiovascular fitness, muscle strength, body composition, depression, anxiety, sleep, cognition, and fatigue)"* (Bouchard et al., 2003, p.12). To improve these physical properties, various training methods are possible such as aerobic/endurance, resistance, coordination and flexibility, offering different psychological and

physiological benefits. To obtain optimal effects from training, varied training principles should be followed (Hoffman, 2002).

The association between an inactive lifestyle and health problems (e.g. heart disease, obesity, diabetes, osteoporosis, anxiety and depression) is well documented (Andersen & Strømme, 2001; Bouchard, Shepard, & Stephens, 1993). On the other hand a healthy lifestyle including PA is related to many health benefits (Andersen & Strømme, 2001; U.S.Department of Health and Human Services., 2008). To be physically active has been associated with lower risk levels for some forms of cancer (i.e. colon, breast and prostate) (Friedenreich & Thune, 2001; Thune & Smeland, 2000a). Other identified health benefits show increased cardiorespiratory function (aerobic and metabolic fitness), improved skeletal muscle function (strength, power and endurance), better motor function (agility, balance, coordination and speed of movement), stronger skeleton and joints (joint structure and function, flexibility and bone density) and an appropriate energy metabolism (Bouchard et al., 1993). Physical activities can also have a positive effect on mental health (Martinsen, 2000). An immediate benefit can be pleasure and experience of succeeding a physical task (Dunn & Blair, 1997), and long lasting effects such as lower levels of stress and depression have also been identified (Martinsen, Medhus, & Sandvik, 1985; Martinsen, Hoffart, & Solberg, 1989). Generally, moderate to high levels of PA are associated with higher levels of physical and emotional well-being (Crews & Landers, 2004).

2.4.2 Recommendations in general

PA and health benefits are related in a somewhat of dose-response relationship; benefits typically increase with more PA. There seems to be no lower limits for these benefits, and as a general rule little activity is better than none (Bouchard et al., 1993). The largest benefits are experienced when going from being totally inactive to being somewhat physically active (U.S.Department of Health and Human Services, 2008). However too much PA may also lead to serious health problems, such as injuries, cardiovascular problems (angina pectoris), asthma, heart stroke, osteoporosis and serious exhaustion (Verhagen, Sluijs, & Mechelen, 2007).

The general population is recommended to be active for at least 150 minutes in moderate-intensity, or 75 minutes in vigorous-intensity activities (or a combination)

during a normal week (U.S.Department of Health and Human Services., 2008). The aerobic activities should be performed in periods of minimum ten minutes, and spread through the whole week. Adults and elderly people with disabilities are recommended to be as physically active as their ability and condition permits (U.S.Department of Health and Human Services, 2008). Recently the World Health Organization and the Norwegian Public Health Department have increased their new recommendations to 30 minutes PA in moderate-intensity every day (210 min per week) (Andersen & Strømme, 2001). Despite the documentation of all health benefits, only 30 % of the adults in Norway have regular PA levels that comply with the PA guidelines (Nasjonalt Råd for Fysisk aktivitet, 2011).

2.5 Physical activity and cancer

2.5.1 Level of physical activity in cancer patients

Recent investigations show a reduction in level of PA among cancer patients during and immediately after cancer treatment (Courneya & Friedenreich, 1997). However, other studies in Norway have suggested that patients often increase PA levels in the time after treatment (Oldervoll et al., 2007; Thorsen et al., 2003a). The amount of active survivors differs between distinct diagnoses. In a mixed group of cancer survivors different activity rates were found among the diagnoses after completed treatment: skin melanoma (47 %), PC 43 %, breast (37 %), colorectal (35 %), bladder (36 %) and uterine (30 %) (Blanchard, Courneya, & Stein, 2008).

A number of studies have investigated level of PA among PC survivors, the percentage of active survivors range between 29 % and 74 % (Thorsen et al., 2008). The highest presented percentage of 74 %, was measured in a group of men with an average age of 73 years, and treated for tumor stages T1 to T4 (Blanchard, Stein, & Baker, 2004). In contrast to this high prevalence, one study reported only 29 % active PC survivors (mean age 75 years) (Coups & Ostroff, 2005). Another study supports these results, with 30 % meeting PA guidelines. This group consists of 843 PC survivors with unknown mean age and stage of tumor (Bellizzi, Rowland, Jeffery, & McNeel, 2005).

Several studies have also investigated changes in level of PA from before diagnosis to after treatment. There have been presented that only 30-60 % of the cancer

survivors, who were active before illness, rebound to the same level of PA after ended treatment (Blanchard et al., 2003; Irwin et al., 2003). Lynch et al. (2007) observed 21 % fewer physically active participants after treatment, than before diagnosis. In their sample meeting PA guidelines were associated with being male, living in rural district, higher educated, healthy weight, not smoking, only surgery and no reported fatigue (Lynch, Cerin, Newman, & Owen, 2007). Later exercise behavior through the cancer process has been investigated in a mixed group of cancer survivors. Before diagnoses 48 % were meeting PA guidelines, this decreased to 45 % after ended treatment. 15% relapsed from being active to inactive, while 12 % increased their level of PA through the cancer process (Gjerset, Fossa, Courneya, Skovlund, & Thorsen, 2011). PA is associated with several health benefits, also in groups of cancer survivors.

2.5.2 Benefits among cancer survivors in general

The increasing number of cancer survivors has lead to a growing interest in the possibility of positive effects from PA on their physical and psychological quality of life (Courneya, 2009). A review evaluated 82 controlled PA trials among cancer survivors, and presented a strong association between being physically active and several positive health outcomes, both during and after cancer treatment (Speck et al., 2010). The quantity of research varies among cancer diagnoses; 83 % of the studies included breast, 11 % lung and 10 % prostate cancer. Sixty percent of the studies were accomplished after ended treatment, while the remaining 40 % took place during the treatment process. The type of training included in the intervention varied (Speck et al., 2010). Cancer survivors have an increased risk of secondary tumor, osteoporosis, overweight and cardiovascular diseases, compared to the general population (Fossa, 2009), but all these outcomes have been proved to benefit from PA (Hoffman, 2002). The positive association between being physically active after ended treatment and several health benefits (e.g. appropriate body weight, quality of life) has also been observed in cross-sectional investigation, among different cancer survivors populations (e.g. endometrial and Non-Hodgkin's lymphoma) (Courneya et al., 2005; Vallance, Courneya, Jones, & Reiman, 2005).

One intervention consisted of six months resistance training for a group of breast cancer patients following treatment; the results demonstrated beneficial effects in both physical and psychological quality of life scores. All these improvements were

associated with increased lean muscle mass and strength (Ohira, Schmitz, Ahmed, & Yee, 2006). Another randomized controlled trial consisted of 12 weeks of supervised aerobic exercise (three times a week) in a sample of lymphoma patients after ended treatment. The exercisers showed significant improved physical functioning (cardiovascular fitness), and positive outcome in other health variables (Coumeya et al., 2009). The effect of a 15-week program of supervised aerobic exercise (15-35 minutes on stationary bicycle, intensity 70 % to 75 % of $VO_{2\ peak,}$ three times a week) were evaluated in a group of breast cancer survivors, and had a positive effect on quality of life variables (fatigue), $VO_{2\ peak}$, body weight and body composition (Courneya et al., 2003b).

The amount of cancer research concerning supportive outcomes such as quality of life, CRF and body image have increased the last years (Courneya, 2009). Special investigation with CRF as end point has expanded and the results are promising. In the previously mentioned review 93 % of the nine latest studies concerning CRF presented positive results, of these 50 % were statistically significant (Speck et al., 2010). Interventions including increased level of PA show strong evidence of being helpful in managing CRF (Stricker, Drake, Hoyer, & Mock, 2004).

After 20 weeks of aerobic endurance training (40-60 minutes of moderate intensity activities, three times a week) in a group of chronically fatigued Hodgkin's survivors, the results showed significantly decreased level of CRF, improved physical functioning and increased maximal aerobic capacity among the intervention group (Oldervoll et al., 2007). Eight weeks with home-based moderate-intensity exercise were completed by women receiving chemotherapy to treat breast cancer. The results predicted decreased extension and duration of CRF in the exercise group (Schwartz, Mori, Gao, Nail, & King, 2001). Cramp & Daniel concluded that exercise can be regarded as beneficial for individuals with CRF, during and post cancer therapy (Cramp & Daniel, 2008).

2.5.3 Benefits among prostate cancer survivors

Both interventions and observational studies have been used to increase the knowledge about PA among PC survivors (Thorsen et al., 2008). Blanchard et al. (2004) observed significantly higher health-related quality of life among active PC survivors than inactive 2.5 and 10 years after diagnosis. The observed group were

staged T1 to T4, and mean age 73 years (Blanchard et al., 2004). Another cross-sectional designed study found a positive association between regular vigorous PA and physical functioning in PC patients (Demark-Wahnefried et al., 2004).

Further interventions investigating PA and health related factors among PC survivors will be presented. Windsor (2004) compared PC survivors that accomplished a home-based walking program with moderate intensity (30 minutes, three times a week), with an inactive control group. Their results showed better physical functioning, but no significant improvement in CRF in the exercisers (Windsor et al., 2004). Reduced CRF, improved quality of life and increased muscular fitness, were found after 12 week of whole body resistance exercise (three times a week) in a group of PC patients receiving androgen deprivation therapy (Segal et al., 2003). Later Segal et al. (2009) completed an intervention comparing aerobic, resistance and usual care of PC survivors. Aerobic training promoted increased aerobic fitness, but this was also demonstrated in the resistance group. The resistance group increased their quality of life and muscular strength, and decreased the amount of triglycerides and body fat. Both resistance and aerobic training decreased the level of CRF compared to the control group, and it is interesting to make notice of more long-lasting effect of resistance training (Segal et al., 2009). These results were supported by Galvao et.al. (2006), and indicated beneficial effect on muscle strength, functional performance, and balance after 20 week of resistance training. Resistances training also preserves a healthier body composition and reduced musculoskeletal distresses; together all this decreased the extent of CRF (Galvao et al., 2006). A follow-up intervention evaluated 12 weeks of combined progressive resistance and aerobic training twice a week, in a sample of 97 PC patients receiving androgen deprivation therapy. The results were beneficial and showed improved muscle mass and strength, physical function, cardio-respiratory capacity and overall health status, which all are conducive to decreased CRF (Galvao, Taaffe, Spry, Joseph, & Newton, 2010).

Quality of life and CRF were examined among 31 PC patients (average age 67 years) receiving androgen deprivation therapy for localized or metastatic tumors. 12 weeks with a combination of aerobic, resistance and flexibility training, three to five times a week, resulted in better results in a 6-minutes walking test, and improved heart rate. There was also a trend toward a positive change in overall quality of life, and decreased fatigue score (Culos-Reed, Robinson, Lau, O'Connor, & Keats, 2007).

Later, 16 weeks with home-based (walking, stretching and light resistance exercisers) and group exercise were completed by PC patients receiving androgen deprivation therapy. Increased level of PA were related to less CRF (Culos-Reed et al., 2010).

As described, multiple side effects might occur after ended cancer treatment, and CRF is documented to be one of the most distressing and common. However, in spite of all these promising results of increased level of PA after treatment and reduced CRF, it is important to be aware that the patients have a serious illness, and some conditions might need to be considered (Thorsen, 2009). As described some studies have investigated this relationship, but more research is needed to determine good management strategies (Speck et al., 2010), and decide the optimal type, intensity and timing of exercise among cancer survivors in general, and PC in particular (Cramp & Daniel, 2008). Because of the negative impact and limits CRF may impose on cancer survivors' life, it is important to find appropriate management strategies to decrease the CRF and maintain the survivors' quality of life. As far as we know no studies have investigated the relationship between pre-diagnosis level of PA and occurrence of CRF. This could be of value as a framework to design further interventions with onset before treatment.

3. Aims

With this background the aims of the present study were to:

1) Examine the level of physical activity before diagnosis (retrospectively) and after treatment in prostate cancer survivors, and to investigate changes in level of PA from before diagnosis to after treatment in the same sample.

2) Examine the relationship between level of physical activity before diagnosis (retrospectively) and occurrence of cancer-related fatigue after treatment among prostate cancer patients.

3) Examine the relationship between level of physical activity after treatment and occurrence of cancer-related fatigue at the same point of time among prostate cancer patients.

The following hypotheses are suggested:

1) The majority of the prostate cancer survivors failed to reach the guidelines for physical activity, both before diagnosis and after treatment, and the percentages of active prostate cancer survivors after ended treatment, are decreased from before diagnosis.

2) Prostate cancer survivors meeting physical activity guidelines before diagnosis report lower fatigue score after treatment, compared with those not meeting physical activity guidelines before diagnosis.

3) Prostate cancer survivors meeting physical activity guidelines after treatment report lower fatigue score after treatment, compared with those not meeting physical activity guidelines after treatment.

4. Methods

To investigate the relationship between level of physical activity (PA) and cancer-related fatigue (CRF) among a group of prostate cancer (PC) survivors, an observational cross-sectional study design was conducted. Data used in the current study was collected as part of the PhD. work by Gjerset, Department of Oncology Oslo University Hospital[1]. Two prior articles have been published from the same original dataset (Gjerset et al., 2011; Gjerset et al., 2011).

4.1 Study participants and procedures

Study participants were identified from the Norwegian Radium Hospital's central register. Testicular, gynecological, prostate, lymphoma and breast cancer were included in the survey. However, in the current study, solely patients treated for PC were selected. Candidates for inclusion were disease-free patients treated for localized prostate cancer (staged T1-T3). Participants received surgery, curatively intended radiotherapy and/or hormone therapy between January 2002 and December 2003. The treatment process needed to be finished between six months and 4.5 years before the study started (except patients treated for androgen deprivation therapy). Patients should to be aged between 18 and 75 years at their first visit to be included in the current study population.

The invited PC patients received a package consisting of an invitation letter, information about the study (Appendix 4), questionnaires including Fatigue Questionnaire (FQ), Godin Leisure Time Exercise Questionnaire (GLTEQ) and health variables (Appendix 1, 2 & 3), as well as a consent form (Appendix 5) and a pre-paid return envelope. This package was sent to 321 eligible men in May 2007, and a reminder was sent to the non-responders after four weeks. The signed consent form was returned along with the questionnaires.

[1] "Need and preferences for exercise counseling among Norwegian cancer patients" also including level of physical activity.

4.2 Measurement

4.2.1 Demographic, medical & health variables

Demographic and medical variables were selected from the medical database at the Norwegian Radium Hospital. These included age, gender, diagnosis, time since diagnosis and disease stage. The remaining health variables were obtained by self-reported measures (Appendix 3) including: height and weight for calculating BMI (BMI less than 25 kg/m² was considered normal; BMI between 25 and 29.9 kg/m² were considered overweight, and BMI ≥ 30 were considered obese), living in couple (yes/no), level of education (primary/secondary school, high school, college/university < 4 years or college/university > 4 years), employment status (fulltime/student/military service, part-time/homemaker, retired, disability, benefit/sick leave or unemployed), comorbidity (defined as any long-lasting physical or psychological illnesses outside of cancer, which had led to reduced daily life functions during the last year), treatment and daily smoking (yes/no) (Appendix 3).

4.2.2 Physical activity assessment

To assess levels of PA, a modified version of the Leisure Score Index from the *Godin Leisure Time Exercise Questionnaire (GLTEQ)* (Appendix 2) was used (Godin, Jobin, & Bouillon, 1986). GLTEQ has been found to be valid and reliable for assessing level of PA (Gionet & Godin, 1989) and has been used in other research concerning PA and cancer (Courneya et al., 2003a; Peddle et al., 2008; Vallance et al., 2005).

Participants were asked to report the average frequency and duration of mild (i.e. minimal effort, no perspiration; e.g. easy walking, yoga, fishing, golf), moderate (i.e. non exhausting light perspiration; e.g. fast walking, tennis, easy biking, dancing), and strenuous (i.e. heart beats rapidly, sweating; e.g. running, ballgames, swimming, cross-country) PA conducted in their leisure time during a typical week at two moments in time; previous (retrospectively), and current level of PA. For each time period, weekly minutes of moderate and strenuous exercise were calculated and used to estimate the participants' level of PA. Those who reported to be active for more than 150 minutes of moderate intensity or 75 minutes of vigorous physical activity per week were categorized as physically active (meeting PA guidelines), whereas those who reported less active time were categorized as inactive (not meeting PA

guidelines) (U.S.Department of Health and Human Services, 2008). GLTEQ also assessed the amount of mild activity, but this information was not used in the estimate of PA levels.

The reported and estimated level of PA at two moments in time made it possible to observe changes in activity habits over time. The participants were divided into four activity changing groups: 1) Maintainers (meeting PA guidelines both before diagnosis and after treatment), 2) Adapters (were not meeting PA guidelines before diagnosis, but increased their level of PA and meet PA guidelines after treatment), 3) Relapsers (were meeting PA guidelines before diagnosis, but decreased their level of PA and are not meeting after treatment), and 4) Inactives (were neither meeting PA guidelines before diagnosis or after treatment).

4.2.3 Fatigue assessment

To assess *fatigue* the Norwegian version of the Fatigue Questionnaire (FQ, Chalder et al., 1993) was used (Appendix 1). The FQ was originally validated in medical care and has later been shown to be efficient for measuring fatigue in cancer populations (Loge et al., 1999). FQ is domain-specific and reflects both the physical and mental aspects of fatigue. It consists of 13 self-reporting items comparing the subjective experience of fatigue symptoms, with the feeling when last feeling well. Seven items measure physical fatigue, assessing the subjective feeling of being exhausted and lacking energy. Four items concern the mental aspects of fatigue, and describe the subjective feeling of being mentally exhausted, encompassing items on concentration, memory and speech. Each item has four responses; “better than usual”, “same as usual”, “more than usual” to “much worse than usual”. In the two last items of the questionnaire the responder reports the duration (<1 week, <3 months, 3-6 months and >6 months) and extent (25%, 50 %, 75 % or all the time) of fatigue (Chalder et al., 1993). It is short and easy to understand, two factors that reduce the risk for misunderstanding. All this together makes FQ appropriate to assess CRF (Chalder et al., 1993). The four response alternatives are valued with a Likert scale (0, 1, 2, 3), and used to construct a continuous score by adding physical (min 0 and max 21) and mental (min 0 and max 12) score into a total fatigue score (min 0 and max 33). Thus, a higher score implies more fatigue.

4.3 Statistical analyses

All statistical analyses were performed using the SPSS statistical software version 16.00 (SPSS, Chicago, IL). Descriptive statistics reported fatigue and PA levels, demographic and medical characteristics (mean, SD, range, percentage) of the overall sample, as well as the group participants meeting or not meeting PA guidelines (table 1). Any differences in demographic and medical variables among the two groups were investigated with t-test (continuous variables) and chi-squared analyses (grouping variables). Mann-Whitney was used to test differences in fatigue scores (physical, mental and total) between those participants meeting and not meeting PA guidelines, both before diagnosis and after treatment (table 2 & 3, figure 8 & 9). The total fatigue scores were presented in the four activity changing groups (table 4), and compared in pairs with a Mann-Whitney (table 5). In all analyses *p*-values below .05 were reported as statistically significant.

4.4 Ethics

The institutional review board and regional ethics committee for medical research approved the study. All participants signed a consent form (Appendix 5).

5. Results

5.1 Sample and participants characteristics

A total of 321 questionnaires were sent out to targeted study participants, 243 (76 %) were returned. Because of missing demographic or medical variables, only 230 (72 %) were selected for further analysis. Furthermore, only participants who answered the Fatigue Questionnaire (FQ) and Godin Leisure Time Exercise Questionnaire (GLTEQ) both before diagnosis and after treatment were included. In total, 143 participants had completed both sets of questionnaires. This represents 44.5 % of all the 321 invited or 62 % of the 230 that were returned.

The demographic and medical characteristics of the overall participants and the meeting/not meeting group are presented in details in table 1. In summary, the overall participants' mean age was 68.5 years (SD = 2.1), 85 % were married or living in a couple, 50 % had completed college/university and 64 % were retired among all participants. In terms of health variables, 66% were overweight or obese (BMI >25), 15 % were daily smokers and 22 % experienced daily comorbidity. The mean number of months since diagnosis was 60 months (SD = 5.2), 57 % of the survivors had localized and 43 % regional disease, 40 % had received a local treatment and 31 % a local in combination with a systematic treatment (see table 1). There were no statistically significant differences in demographic, medical and health variables between the meeting and not meeting group, neither before diagnosis nor after treatment (see table 1), and a further multivariate analysis was not of current interest.

Table 1: *Demographic, medical and health characteristics of participants*

		Meeting PA guidelines before diagnosis			Meeting PA guidelines after treatment		
Variable	Total	No	Yes	p	No	Yes	p
No of participants	143	85 (59 %)	58 (41 %)		80 (56 %)	63 (44 %)	
Demographic							
Age							
Mean	68.5 (±5.24)	68.5 (±5.46)	68.4 (±4.94)	.95	68.7 (±5.60)	68.13 (±4.77)	.5
Minimum	56.7	56.7	58.1		56.7	59.7	
Maximum	80	80	77.5		80	77.5	
Married/Cohabitant (n=143)				.82			.55
Yes	122 (85 %)	73 (86 %)	49 (84 %)		67 (84 %)	55 (87 %)	
No	21 (15 %)	12 (14 %)	9 (16 %)		13 (16 %)	8 (13 %)	
Education(n=143)				.34			.7
Primary/secondary school	25 (18 %)	13 (15 %)	12 (21 %)		15 (19 %)	10 (16 %)	
High school	46 (32 %)	28 (33 %)	18 (31 %)		24 (30 %)	22 (35 %)	
College/university <4 years	35 (24 %)	18 (21 %)	17 (29 %)		22 (27 %)	13 (21 %)	
College/university >4 years	37 (26 %)	26 (31 %)	11 (19 %)		19 (24 %)	18 (29 %)	
Employment status (n=143)				.82			.51
Fulltime	30 (21 %)	16 (19 %)	14 (24 %)		17 (21 %)	13 (21 %)	
Part-time	9 (6 %)	6 (7 %)	3 (5 %)		3 (4 %)	6 (10 %)	
Retired	92 (64 %)	55 (65 %)	37 (64 %)		54 (67.5 %)	38 (60 %)	
Disability benefit/sick leave	12 (8 %)	8 (9 %)	4 (7 %)		6 (7.5 %)	6 (10%)	
Health							
BMI (n=135)				.17			.33
Healthy <25 kg/m²	46 (34 %)	23 (28 %)	23 (43 %)		23 (30 %)	23 (39 %)	
Overweight 25-29,9 kg/m²	67 (50 %)	42 (52 %)	25 (46 %)		42 (55 %)	25 (42 %)	
Obese ≥ 30 kg/m²	22 (16 %)	16 (20 %)	6 (11 %)		11 (14 %)	11 (19 %)	
Daily smoking (n=143)				.23			.91
No	122 (85 %)	75 (88 %)	47 (81 %)		68 (85 %)	54 (86 %)	
Yes	21 (15 %)	10 (12 %)	11 (19 %)		12 (15 %)	9 (14 %)	
Comorbidy (n=137)				.39			.1
No	107 (78 %)	62 (76 %)	45 (82 %)		57 (73 %)	50 (85 %)	
Yes	30 (22 %)	20 (24 %)	10 (18 %)		21 (27 %)	9 (15 %)	

Time since diagnosis (n=143)						
Mean months (SD)	60.3 (±5.24)	61.53 (±11.81)	58.47 (±10.16)		61.01 (±12.75)	59.37 (±8.97)
<5 years	71 (50 %)	43 (51 %)	28 (48 %)	.79	39 (49 %)	32 (51 %)	.81
≥5 years	72 (50 %)	42 (49 %)	30 (52 %)		41 (51 %)	31 (49 %)	
Disease stage				.44			.97
Localized	82 (57 %)	51 (60 %)	31 (53 %)		46 (57.5 %)	36 (57 %)	
Regional	61 (43 %)	34 (40 %)	27 (47 %)		34 (42.5 %)	27 (43 %)	
Treatment (n=143)				.64			.79
One local treatment	57 (40 %)	37 (44 %)	20 (34 %)		34 (43 %)	23 (37 %)	
Two local treatments	11 (8 %)	7 (8 %)	4 (7 %)		5 (6 %)	6 (10 %)	
One local treatment + systemic treatment	44 (31 %)	25 (29 %)	19 (33 %)		25 (31 %)	19 (30 %)	
Two local treatments+ systemic treatment	31 (22 %)	16 (19 %)	15 (26 %)		16 (20 %)	15 (24 %)	

Numbers may not add up to 143 because of missing data. Values are described in mean (±SD) and number in percentage (%).

5.2 Level of physical activity before diagnosis and after treatment

Figure 7 shows the participants' level of PA, both before diagnosis and after ended treatment. Of the overall sample 41 % (n = 58) reported to meet PA guidelines before diagnosis, and after treatment this had increased to 44 % (n = 63) (figure 7). Fifty nine percent (n = 85) were inactive before and 56 % (n = 80) after. In total, 32 % (n = 46) were meeting PA guidelines both before diagnosis and after treatment, 48 % (n = 68) of the participants failed to reach PA guidelines at both times. Twelve percent (n=17) adopted an active lifestyle during the cancer process, and 8 % (n = 12) relapsed from meeting PA guidelines to not meeting (see figure 7).

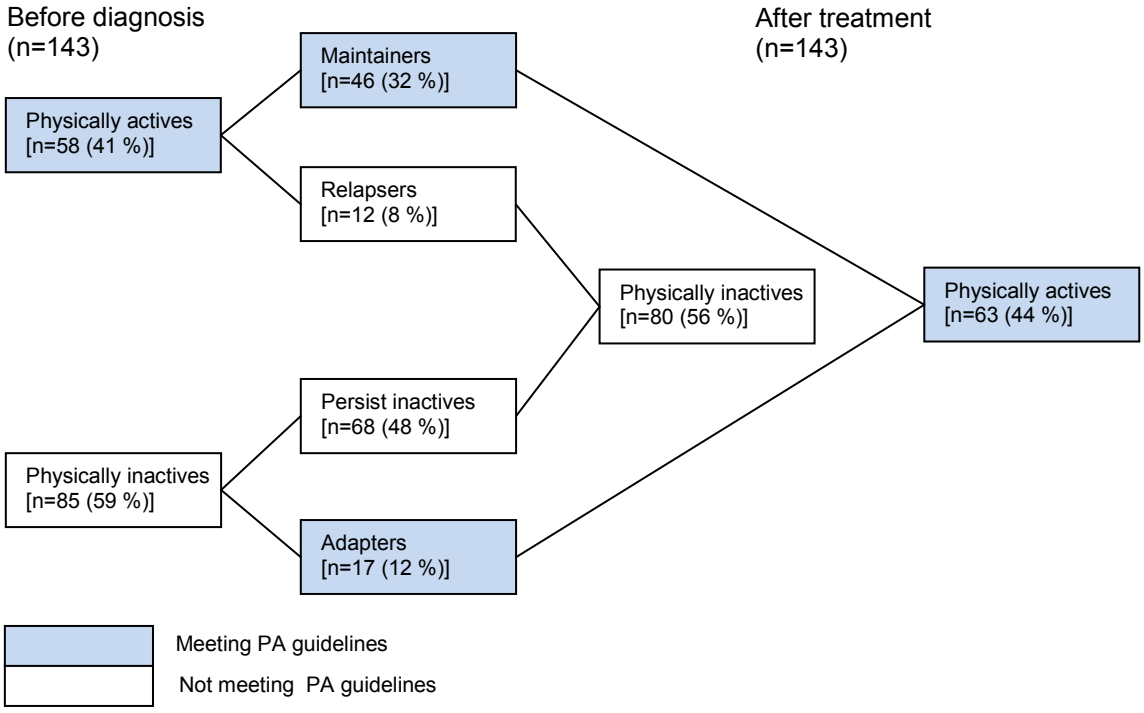

Figure 7: *Meeting or not meeting PA guidelines before diagnosis and after treatment*

5.3 Physical activity before diagnosis and fatigue score

Fatigue scores were compared between survivors meeting PA guidelines, and not meeting PA guidelines before diagnosis. Findings are illustrated in figure 8.

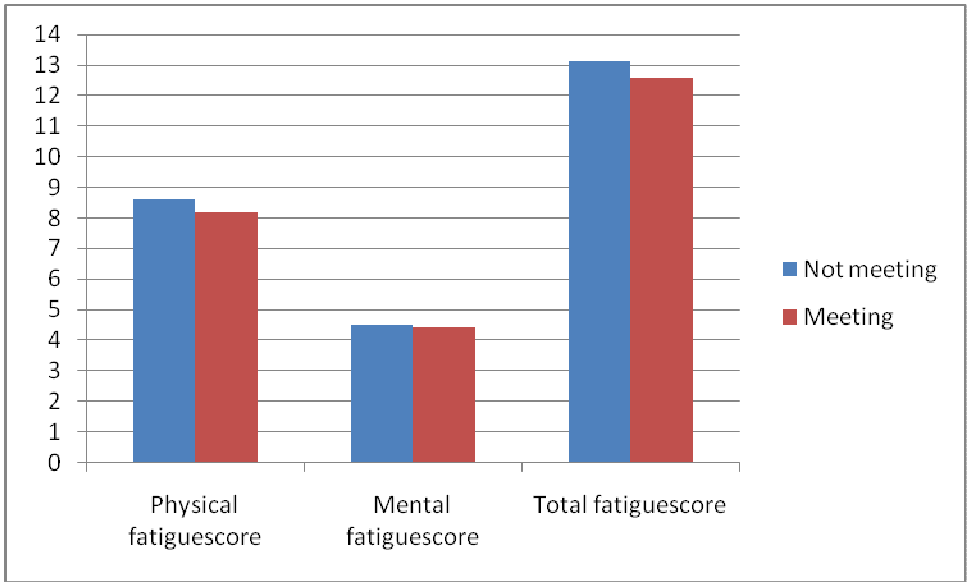

Figure 8: *Fatigue score in participants meeting or not meeting PA guidelines before diagnosis*

Those meeting PA guidelines before diagnosis reported a significantly (p = .05*) lower total fatigue score (M = 12.6, SD = 4.38) compared to those not meeting PA guidelines (M = 13.14, SD = 3.08). There was a tendency for the group meeting PA guidelines to report lower score in physical fatigue than the not meeting group (p=.084). No statistical difference was observed on mental fatigue between the groups (p = .25) (see table 2).

Table 2: *Meeting or not meeting PA guidelines before diagnose and fatigue score (mean) (SD)*

Fatigue score	Total (n=143)	Not meeting (n=85)	Meeting (n=58)	p-value
Physical fatigue	8.45 (± 2.94)	8.62 (± 2.53)	8.19 (± 3.47)	.084
Mental fatigue	4.48 (± 1.22)	4.52 (± 1.13)	4.41 (± 1.35)	.25
Total fatigue	12.92 (± 3.66)	13.14 (± 3.08)	12.6 (± 4.38)	.05*

* $p \leq .05$

5.4 Physical activity after treatment and fatigue score

The fatigue scores were compared between patients reported to meet PA guidelines, and not meeting PA guidelines after ended treatment. Findings are illustrated in figure 9.

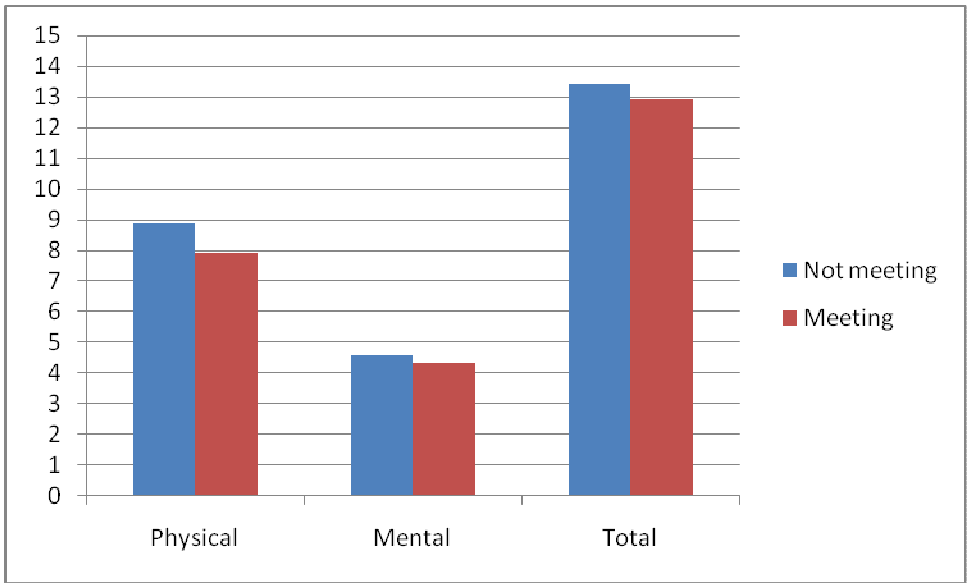

Figure 9: *Fatigue score in participants meeting or not meeting PA guidelines after treatment*

Those meeting PA guidelines reported significant lower scores in all three aspects of fatigue than those not meeting PA guidelines. Physical fatigue in the meeting group was (M = 7.92, SD = 3.13) compared to the not meeting group (M = 8.86, SD = 2.74) (p = .004*). The mental scores were (M = 4.35, SD = 1.3) in the meeting group and (M = 4.58, SD = 1.12) among the not meeting (p = .04*). Respectively the total score were (M = 12.27, SD = 4.01) and (M = 13.43, SD = 3.28) (p =.002*) (see table 3).

Table 3: *Meeting or not meeting PA guidelines after treatment and fatigue score (mean) (SD)*

Fatigue score	Total (n=143)	Not meeting (n=80)	Meeting (n=63)	p-value
Physical fatigue	8.45 (± 2.94)	8.86 (± 2.74)	7.92 (± 3.13)	.004*
Mental fatigue	4.48 (± 1.22)	4.58 (± 1.12)	4.35 (± 1.3)	.04*
Total fatigue	12.92 (± 3.66)	13.43 (± 3.28)	12.27 (± 4.01)	.002*

* $p \leq .05$

5.5 Fatigue scores associated with changes in level of physical activity

Among the relapsers, the physical fatigue (M = 9.5, SD = 3.78) score was higher compared to the other groups. In mental fatigue score the inactives reported (M = 4.59, SD = 1.23), while the adapters (M = 4.24, SD = 0.56). The relapsers also reported the highest total fatigue score (M = 14.00, SD = 4.20), and the maintainer the lowest (M = 12.24, SD = 4.39) (see table 4).

Table 4: *Fatigue scores in the activity changing groups*

	n	Physical fatigue	Mental fatigue	Total fatigue
Maintainers	46	7.85 (± 3.34)	4.39 (± 1.48)	12.24 (± 4.39)
Adapters	17	8.12 (± 2.55)	4.24 (± 0.56)	12.35 (± 2.83)
Relapsers	12	9.50(± 3.78)	4.50 (± 0.67)	14.00 (± 4.2)
Inactives	68	8.45 (± 2.53)	4.59 (± 1.23)	13.34 (± 3.13)
Total	143	8.45 (± 2.94)	4.48 (± 1.22)	12.92 (± 3.66)

Comparing total fatigue score among the group of changing in level of PA, the difference were only significant (p=.04*) between the inactives and the maintainers (see table 5).

Table 5: *Differences in total fatigue score among the activity changing groups*

	Maintainers	Adapters	Relapsers	Inactives
Maintainers	-	.67	.098	.04*
Adapters	.67	-	.254	.11
Relapsers	.098	.25	-	.73
Inactives	.04*	.11	.73	-

* $p \leq .05$

6. Discussion

The current study has observed an important population of prostate cancer (PC) survivors of which a majority fails to meet daily physical activity (PA) guidelines. There were less relapsers than adapters, so the numbers of active increased during the cancer process. One of the main aims of this study was to examine cancer-related fatigue (CRF) after treatment between PC survivors meeting and not meeting PA guidelines prior to diagnosis. Findings indicate that having an active lifestyle before getting ill is associated with decreased occurrence of CRF after treatment. Additionally, participants who reached PA guidelines after completed treatment also reported lower fatigue scores.

6.1 Main results

6.1.1 Level of physical activity before diagnosis and after treatment

Despite numerous well-known health benefits of being physical active in the general population, only 41 % of the current sample reported to reach PA guidelines before the illness (retrospectively). Corresponding prevalence in the general Norwegian population was lower, and only 30 % reports be active (Nasjonalt Råd for Fysisk aktivitet, 2011). Because it allows for comparison; in an age-matching (60 to 69 years) group of Norwegian men 26 % reported to meet PA guidelines (Andersen et al., 2009), as we can see, this is less than the current sample. Kruger et al. (2007) presented activity rate among American men aged above 65 years, 44.5 % were meeting PA guidelines. Levels of PA before diagnosis have been reported in other cancer populations. In a group of non-Hodgkin's lymphoma cancer survivors, 34 % were meeting PA guidelines before getting ill (Vallance et al., 2005), and among a group of colorectal cancer survivors only 25 % reported to meet PA guidelines before diagnosis (Peddle et al., 2008). Compared to current sample of PC survivors, both the group of non-Hodgkin's lymphoma and colorectal survivors had a lower activity rate. The differences in level of PA prior diagnosis are likely to be influenced by the same factors as in the general population: age, gender, socioeconomic status (Andersen et al., 2009).

In the current sample of PC survivors the number of relapsers was less than adapters, and the activity rate had increased to 44 % after completed treatment. This rate of

active PC survivors is right in the middle of previous measured activity rates among corresponding samples. The number of reported active PC survivors differ, and the following percentages have previous been presented: 50 % (Demark-Wahnefried et al., 2004), 74 % (Blanchard, Courneya, Rodgers, & Murnaghan, 2002), 29 % (Coups & Ostroff, 2005), 30 % (Bellizzi et al., 2005) and 43 % (Blanchard et al., 2008). The last study included several other cancer populations with an activity rate ranging from 30 % to 47 % (Blanchard et al., 2008). In a group of Norwegian testicular cancer survivors, 43 % reported to meet PA guidelines (Thorsen et al., 2003a). Testicular cancer is another common cancer diagnosis among men, occurring more frequently in the younger population than PC (Klepp, 2000). However, a lower aged sample, this is corresponding to the present results. In a group of Hodgkin's disease survivors 48 % reported to be physical active (Oldervoll et al., 2007). A considerable higher percentage was presented in a group of breast, colon, and PC patients, 70 % reported to meet PA guidelines (Blanchard et al., 2004). As of today there exists no gold standard measurement or cut-off points to assess level of PA, either among cancer survivors or the general population, this might make comparisons challenging. It is also of importance that disease- and treatment-related responses may vary between tumor site due to the tumors pathology, specific treatment side effects, and the patients' demographic profile.

Several studies have shown decreases in level of PA during cancer process, for example among non-Hodgkin's lymphoma survivors a 10 % decrease was recorded following diagnostic and treatments (Vallance et al., 2005), PA rate decreased with 5 % among bladder survivors (Karvinen, Courneya, North, & Venner, 2007), while in a group of colorectal cancer survivors the percentage of physically active survivors were considerable lower (21 %) after treatment than before diagnosis (Lynch et al., 2007). Conversely results were presented 11 years after ended treatment in a group of testicular cancer survivors, where the level of PA was higher than before diagnosis. The researchers suggested that the increased level of PA might be related to psychological distress and feeling of decreased masculinity and changing in body image, caused by the side effects testicular cancer and treatment can produce. To compensate for this loss, the patients perform more PA (Thorsen et al., 2003a). This theory might also be useful in the sample of prostate cancer. As previously mentioned plural of the treatments side effects can decrease the physical

fitness, make changes in body and reduce the sexual functioning (Klepp, 2000). Finally, a cancer diagnosis can be a critical life transition, also called a "teachable moment" that can promote positive change, and increased attention to health and exercise counseling (Demark-Wahnefried, Aziz, Rowland, & Pinto, 2005; Gjerset et al., 2011).

Some changes in PA habits occurred through the cancer process among the sample of PC survivors. Among the 44 % active PC survivors after treatment, 32 % had maintained their satisfying level of PA from before diagnosis, while 12 % had adapted appropriate activity habits. In total 47 % persisted in being inactive through the whole cancer process, and 8% relapsed from meeting PA guidelines before diagnosis to not meeting after treatment. Alteration in exercise behavior from before diagnosis to after treatment has been investigated in a mixed group of cancer survivors (PC, lymphoma, testicle, breast, gynecological). In this sample 48 % were meeting PA guidelines before diagnoses, after ended treatment this decreased to 45 %. 15% relapsed from being active to inactive, while 12 % increased their level of PA through the cancer process (Gjerset et al., 2011). The amount of active cancer survivors decreased in the mixed group, while it increased in the group of only PC survivors. This might predict that some of the other cancer diagnosis in the mixed sample cause severe decreasing in physical functioning and more side effects than PC.

Compared with other cancer survivor's populations, the current study show that PC survivors have an average level of PA. The increased level of PA during the cancer process is positive, and might reduce the risk of a secondary tumor, osteoporosis, overweight and cardiovascular diseases (Lee, 2006). However the majority still fails to reach the recommended level of PA, and lose the associated health benefits. Furthermore, to prevent relapsing and increase level of PA after ended treatment is important. One step might be to identify factors characterizing maintainers and adapters.

6.1.2 Physical activity before diagnosis and fatigue score

To our knowledge, this study is the first to examine the relationship between levels of PA prior to diagnosis and fatigue score among PC survivors. The results

confirmed the second hypotheses; PC survivors meeting PA guidelines before illness experience lower levels of CRF after completed treatment, than the not meeting group. There are several possible explanations to this positive relationship between meeting PA guidelines before diagnosis and lower fatigue score after treatment. Being physically active is associated with a number of health benefits and an increased physical capacity (Hoffman, 2002; U.S.Department of Health and Human Services., 2008), this might make the active cancer survivors better prepared and equipped to manage the stress of the cancer and the treatments reducing of overall fitness. The physical capacity will also influence individuals' ability to restitute (Hoffman, 2002), a good physical capacity before treatment may decrease the time of restitution and make it easier returning to the prediagnosis level of PA. Another possible explanation of this relationship is that greater numbers of the PC that meet PA guidelines prior to diagnosis were active after completed diagnosis. Therefore the positive relationship might be explained by motivational factors to be active after treatment, rather than physical benefits from before diagnosis.

Cancer investigation has been characterized by case-controls, randomized control trials and interventions during and after ended treatment, for that reason there are few studies to compare with (Courneya, 2009). The current study presented positive associations between being physically active before diagnosis, and lower fatigue scores after ended treatment. This might be used as framework for future research in the pretreatment phase. The optimal strategy for examining the trajectory of PA following cancer diagnosis and treatment would involve prospective, longitudinal assessment of level of PA. Identifying high-risk groups of CRF might also be helpful to reduce CRF among the physically inactive patients, and motivate this group to increase their level of PA.

6.1.3 Physical activity after treatment and fatigue score

The relationship between meeting PA guidelines after treatment and lower fatigue score was significant and positive; accordingly the third hypothesis was confirmed. This beneficial association is in line with previous research; quality of life, physical functioning, improved cardiorespiratory fitness, less distress and fatigue are all outcomes associated with an appropriate level of PA among cancer survivors

(Courneya & Friedenreich, 1999; Cramp & Daniel, 2008; Knols, Aaronson, Fransen, & Aufdemkampe, 2005; Speck et al., 2010).

The positive relationship among PC survivors meeting guidelines and lower fatigue score is consistent with several cross-sectional studies. In a study by Karvinen et al. (2007) the association between exercise and quality of life was observed among bladder cancer survivors, meeting PA guidelines was significantly associated with less CRF. Among a group of colorectal cancer survivors the quarter that were meeting PA guidelines, reported significantly lower in a fatigue subscale (Peddle et al., 2008). Hodgkin's lymphoma survivors meeting PA guidelines after ended treatment reported lower fatigue score and higher quality of life than those not meeting (Vallance et al., 2005). Corresponding results were also observed among multiple myeloma cancer patients (Jones et al., 2004). All these observational studies presented benefits of being physical active. However, to investigate the effect of specific training programmes (e.g. aerobic, resistance), interventions are needed.

A number of PA interventions that have been accomplished examined fatigue among PC survivors, all demonstrating reductions (Culos-Reed et al., 2007; Culos-Reed et al., 2010; Galvao et al., 2006; Galvao et al., 2010; Segal et al., 2003; Segal et al., 2009; Windsor et al., 2004). All presented increased physical fitness and a reduced level of CRF, as a result of either resistance or aerobic training (or a combination). However Segal et al. (2009) presented more a long-lasting effect of resistance training, than aerobic training. Improved physical functioning may be necessary to combat CRF (Windsor et al., 2004). An inverse relationship between CRF and PA is supported in a large amount of research among cancer survivors. Being physically active can break the vicious circle of fatigue caused inactivity (Dimeo, Rumberger, & Keul, 1998; Speck et al., 2010).

However, opposite results are also found in studies concerning the association between level of PA and CRF. A supervised, home-based, flexible training program short time after ended chemotherapy, had positive effect in cardiorespiratory fitness among a mixed group of cancer patients, but no effect on the patients' experience of fatigue, mental distress or health-related quality of life were detected (Thorsen et al., 2003b). The researchers suggested that the surprising results may be caused by the

interventions timing. An early onset of the activity before the survivors have restituted after treatment, might worsen the extension of fatigue (Thorsen et al., 2003b). This demonstrates the complexity of composing an intervention among cancer survivors, and that there are many factors to consider. Timing of the activity is important, and results predict that activity in the survivorship phase is preferable compared to during the active treatment process (McNeely & Courneya, 2010). Every cancer patient will experience the diagnosis different, and to individualize is another important factor in amelioration CRF. For some patients it is most appropriate to work out in the morning, while others have more energy in the evening (National Comprehensive Cancer Network, 2011).

In the current study the association between meeting PA guidelines after treatment and fatigue was stronger than between being active prior treatment and fatigue score. However, meeting PA guidelines before diagnose can decrease the risk of some cancers (Tretli.S., 2000a), gain other health benefits (U.S.Department of Health and Human Services., 2008) and as observed in the current study lower fatigue score after treatment. The majority of the group meeting PA guidelines after ended treatment was also active before diagnosis, which might be explained by motivational factors. Given that CRF is a well-known barrier to exercise in cancer survivors, exercise motivation will be a particular challenge for survivors with CRF (Cramp & Daniel, 2008).

After all, these results present a positive association between meeting PA guidelines after treatment, and decreased level of CRF. Given the ongoing and devastating effect CRF might have on PC patients life, these results support PA as an appropriate strategy to maintain the PC quality of life in the years after ended treatment.

Activity changing groups and fatigue score

Among the 44 % (63) of the sample meeting PA guidelines after treatment, 32 % (46) maintained their satisfying level of PA from before diagnosis, and 12 % (17) adopted this preferred behavior during the cancer process. The physical fatigue score (1.65) ranged more than the mental score (0.35). The current study findings might indicate that mechanisms related to CRF are more conducted to physical factors rather than mental distresses. Another study among Hodgkin's disease survivors suggest that chronic fatigue in long term cancer survivors may be associated with more physical than psychological aspects of long term survivorship (Hjermstad et al., 2006). Survivors can help to explain the pattern of fatigue, additional hypotheses concerning the etiology of CRF may be raised as the same level of fatigue could be measured with different etiologies.

6.2 Methods

6.2.1 Study design

This cross-sectional study assessed the relationship between PA levels and occurrence of CRF in a population of PC patients, the study design does not allow causal associations. However, associations might be exposed and hypotheses can be generated, and used as framework to future research with other study designs (Rothman & Greenland, 1998).

6.2.2 Study participants and procedures.

In cross-sectional investigation, inclusion criteria is important to facilitate generalization, and in order to obtain high *external validity* (Thomas & Nelson, 2001). All PC survivors treated at the Norwegian Radium Hospital between January 2002 and December 2003 were invited to participate. They represent disease-free Norwegian PC patients that have completed their treatment (either surgery, radiotherapy or hormone therapy) for localized PC staged T1 to T3, that were between the age of 18 and 75 years at the time of their first cancer-related consultation at the hospital. The targeted participants came from both cities and rural districts of the "Helse Sørøst" region in Norway.

The *internal validity* depends on several factors, the response rate is essential to the representativeness of the study population. In the current study the compliance rate may have had an effect on the generalization of the findings, however due to the seriousness of the disease, it may actually be perceived as strength of the current study that half of the incited population has answered appropriately to the whole questionnaire. With PA and fatigue as topics, it is possible that the 143 men answered both FQ and GLTEQ are more attracted to PA than the non-responders. With 100 % compliance, we might have a group of lower level of PA and higher fatigue score. The included sample was aged between 57 years and 80 years old (mean 68.5), which reflects the PC population.

6.2.3 Measurements

Self-reporting questionnaire

An advantage of this study is the use of valid and reliable questionnaires, which decrease the risk of misunderstanding question. One limitation is that there often is a gap between subjective and objective collected data (Troiano, 2007). The respondents' beliefs and their voluntary and involuntary preferences can affect their answers (Rothman, 2002).

Level of physical activity - Godin Leisure Time Exercise Questionnaire

A modified version of GLTEQ was chosen to assess the participants' levels of PA. Jacobs et al. (1993) found this preferable to nine other self-reporting measurements concerning exercise behavior (Jacobs, Jr., Ainsworth, Hartman, & Leon, 1993). An evaluation of these questions demonstrates that self-reported questionnaires are reliable and valid to assess level of PA. The questions "accept" inactive behavior and are simple to understand. This reduces the risk of over-estimating level of PA, misclassifying the intensity or misunderstanding the questions (Godin et al., 1986). However, there are some weaknesses; GLTEQ asks about PA habits in a normal week, this implies regular training. Many people change their habits with the seasons, and PA is often unsystematic, therefore it can be intractable to estimate, and especially to recall. The two questionnaires measuring level of PA before and after are almost identical, which can be confusing, and the participants might answer only one. A number of questionnaires concerning PA habits exist; The International Physical Activity Questionnaire (IPAQ) is a more extending questionnaire, while other studies use a single question like "How has your physical activity level in your leisure time been the last year?" (image a weekly average for the year, walking to your working place counts as leisure time) (Thorsen et al., 2003a).

Prospective research design presents a challenge for the participants in that they are asked to recall the duration and intensity of their physical activity pre-diagnosis, often several years earlier, which represents a possible source of error described as *recalled bias* (Rothman, 2002*)*. Patients that have been seriously ill might become particularly aware of their health-status, and may report a higher level of PA in

purpose to hide the reality (Oldervoll et al., 2007). The possibility also exists that previously ill persons have a reduced general condition and "falsely" report high-intensity activities, because of low physical fitness. Thus the risk of misclassification cannot be excluded, although its impact is limited (Thomas & Nelson, 2001). Social desirability and increased focus on PA and health in the society might confound and lead to an overestimated level of PA (Rothman, 2002). In a report of level of PA among older Norwegians, only 50 % of those categorized as physical active assessed with subjective measurements, were confirmed to be active with objective measurements (Helsedirektoratet, 2009). Self-reported questionnaires are beneficial in large populations because they are easy to manage, time-saving and economic.

Even though both the Norwegian Public Health Department and the World Health Department have increased their recommendations for PA to at least 30 minutes activity every day (Andersen et al., 2009; World Health Organization, 2010), the *PA guidelines for Americans* were found appropriate to use. This increases the ability to compare with other observational studies (Gjerset et al., 2011), and interventions often have a corresponding level of PA (Speck et al., 2010). Previous research about level of PA has proved increased validity when dividing the sample into activity groups (Rauh, Hovell, Hofstetter, Sallis, & Gleghorn, 1992). In the current study the PC survivors were distinguished into meeting and not meeting PA guidelines. Although this is a broad classification, it is considered to be valid (Gionet & Godin, 1989). The ranges of standard deviations in level of PA support the dividing into activity groups. Only activities performed in the leisure-time were included (Godin et al., 1986), a consequence can be underestimation of PA level among participant with work that make demands to the physical capacity.

Fatigue - Chalder fatigue questionnaire

Advantages of FQ is that it has been used in Norway before, distinguishes between mental and physical aspects of fatigue, and is domain-specific with fatigue as end-point (Wessely, 1992). The questionnaire is easy to understand and has a concise form, which reduces the risk of misunderstanding (Chalder et al., 1993). There exist several other questionnaire e.g. Functional Assessment of Cancer Therapy-Fatigue scale (FACT-F), the fatigue subscale of the Profile of Mood States (POMS) and Piper Fatigue Scale, all with different strengths and limitations. Reasoned the current

studies purpose, FQ were found appropriate to measure CRF in the targeted population of PC survivors,

7. Conclusion

Less than half of the participants were physically active before diagnosis or after treatment. The majority did not change their level of physical activity (PA) after treatment compared to before diagnosis. This means that the majority of prostate cancer (PC) survivors failed to reach PA guidelines at both moments in time. There were less relapsers than adapters, and the group of active PC survivors were increased. This means that the first hypothesis only partly was confirmed. There was a relationship between level of PA before diagnosis and occurrence of cancer-related fatigue (CRF). To meet PA guidelines before diagnosis was significantly associated with lower fatigue score after treatment. This is an understudied field in cancer research, and the current result might be a framework for more study in the pretreatment phase. PC survivors meeting PA guidelines after ended treatment scored significantly lower in all three fatigue scores (physical, mental and total), than those not meeting the physical activity guidelines. Accordingly, the results support that if there are no contraindication in that PA should be recommended to PC patients both prior and after treatment to reduce their CRF, and obtain several other health benefits. However randomized clinical trials are needed to investigate and establish causal effect.

8. Further research

Future research is needed in order to increase the knowledge about physical activity (PA) as a potential strategy to manage side effects of prostate cancer (PC) and its treatment. The results in the current study simply observed less occurrence of cancer-related fatigue (CRF) after treatment, in the group that was active before being diagnosed with PC. As Courneya (2009) emphasized more research is needed, and interventions in the time before treatment might have potential in cancer care (Courneya, 2009). The current study's results can be used as framework for future research. The observed association between meeting PA guidelines after treatment and lower fatigue scores support previous research. However, not all patients benefit from PA, and those who do not need to be identified. Even an increased extension, more research purposed to identify optimal timing, type frequency, intensity and duration of PA program among both PC survivors and the whole cancer population is required. In particular, identification of determinants, beliefs and motivations to be physically active, through and after a cancer process is also needed. To manage the CRF, future research concerning the underlying pathophysicological causes is needed. This can be used to support clinical efforts and increase the number of survivors enhancing appropriate level of PA.

9. Abbreviations

PA	Physical Activity
PC	Prostate Cancer
CRF	Cancer-Related Fatigue
FQ	Fatigue Questionnaire
GLTEQ	Godin Leisure Time Exercise Questionnaire

10. Reference list

Adamsen, L., Quist, M., Andersen, C., Møller, T., Herrstedt, J., Kronborg, D. et al. (2009). Effect of a multimodal high intensity exercise intervention in cancer patients undergoing chemotherapy: randomised controlled trial. *British Medical Journal, BMJ;339:b3410*.

Andersen, S. A., Hansen, B. H., Kolle, E., Lohne-Seiler, H., Edvardsen, E., Holme, I. et al. (2009). *Fysisk aktivitet blant voksne og eldre i Norge-Resultater fra kartlegging i 2008 og 2009.* Oslo: Helsedirektoratet.

Andersen, S. A. & Strømme, S. B. (2001). Physical activity and health - recommendations [In Norwegian]. *Tidsskrift for Den Norske Lægeforening, 17,* 2037-2041.

Andersen, T. I. (2000). Tumorbiologi. In *Kreftsykdommer. En basisbok for helsepersonell*. Oslo: Gyldendal Norsk Forlag.

Avellaneda, F. A., Perez, M. A., Izquierdo, M. M., Arruti, B. M., Barbado Hernandez, F. J., de la Cruz, L. J. et al. (2009). Chronic fatigue syndrome: aetiology, diagnosis and treatment. *BMC Psychiatry, 9 (Suppl. 1),* 1.

Bellizzi, K. M., Rowland, J. H., Jeffery, D. D., & McNeel, T. (2005). Health behaviors of cancer survivors: examining opportunities for cancer control intervention. *Journal of Clinical Oncology, 23,* 8884-8893.

Blanchard, C. M., Courneya, K. S., Rodgers, W. M., & Murnaghan, D. M. (2002). Determinants of exercise intention and behavior in survivors of breast and prostate cancer: an application of the theory of planned behavior. *Cancer Nursing, 25,* 88-95.

Blanchard, C. M., Courneya, K. S., & Stein, K. (2008). Cancer survivors' adherence to lifestyle behavior recommendations and associations with health-related quality of life: results from the American Cancer Society's SCS-II. *Journal of Clinical Oncology, 26,* 2198-2204.

Blanchard, C. M., Denniston, M. M., Baker, F., Ainsworth, S. R., Courneya, K. S., Hann, D. M. et al. (2003). Do adults change their lifestyle behaviors after a cancer diagnosis? *American Journal of Health Behavior, 27,* 246-256.

Blanchard, C. M., Stein, K. D., & Baker, F. (2004). Association between current lifestyle behaviors and health-related quality of life in breast, colorectal and prostate cancer survivors. *Psychology & Health, 19,* 1-13.

Bouchard, C., Blair, S. N., & Haskell, W. L. (2003). Why Study Physical Activity and Health? In C.Bouchard, S. N. Blair, & W. L. Haskell (Eds.), *Physical Activity and Health* (pp. 3-20). Champaign: Human Kinetics.

Bouchard, C., Shepard, R. J., & Stephens, T. (1993). *Physical activity, fitness and health. Concensus Statement.* Champaign IL: Human Kinetics publisher.

Brawley, O. W., Knopf, K., & Thompson, I. (1998). The epidemiology of prostate cancer part II: the risk factors. *Seminars in Urologic Oncology, 16,* 193-201.

Brenhovd, B. (2011). *Oncolex-prostata*. http://www.oncolex.no/en/Prostata.aspx . 11-5-2011.

Ref Type: Online Source

Cancer Registry of Norway (2010). *Cancer in Norway- Cancer incidence, mortality, survival and prevalence in Norway* Oslo: Cancer Registry of Norway-Institute of Population-based Cancer research.

Cella, D. (1998). Factors influencing quality of life in cancer patients: anemia and fatigue. *Seminars in Oncology, 25,* 43-46.

Cella, D., Peterman, A., Passik, S., Jacobsen, P., & Breitbart, W. (1998). Progress toward guidelines for the management of fatigue. *Oncology (Williston.Park), 12,* 369-377.

Chalder, T., Berelowitz, G., Pawlikowska, T., Watts, L., Wessely, S., Wright, D. et al. (1993). Development of a fatigue scale. *Journal of Psychosomatic Research, 37,* 147-153.

Chen, M. K. (1986). The epidemiology of self-perceived fatigue among adults. *Preventive Medicine, 15,* 74-81.

Conn, V. S., Hafdahl, A. R., Porock, D. C., McDaniel, R., & Nielsen, P. J. (2006). A meta-analysis of exercise interventions among people treated for cancer. *Supportive Care in Cancer, 14,* 699-712.

Coumeya, K. S., Sellar, C. M., Stewart, D. A., McNeely, M. L., Peddle, C. J., Friedenreich, C. M. et al. (2009). Randomized controlled trial of the effects of aerobic exercise on physical functioning and quality of life in lymphoma patients. *Journal of Clinical Oncology, 20,* 4605-4612.

Coups, E. J. & Ostroff, J. S. (2005). A population-based estimate of the prevalence of behavioral risk factors among adult cancer survivors and noncancer controls. *Preventive Medicine, 40,* 702-711.

Courneya, K. S. (2009). Physical activity in cancer survivors: a field in motion. *Psycho-Oncology, 18,* 337-342.

Courneya, K. S. & Friedenreich, C. M. (1997). Relationship between exercise pattern across the cancer experience and current quality of life in colorectal cancer survivors. *Journal of Alternative and Complementary Medicine, 3,* 215-226.

Courneya, K. S. & Friedenreich, C. M. (1999). Physical exercise and quality of life following cancer diagnosis: a literature review. *Annals of Behavioral Medicine, 21,* 171-179.

Courneya, K. S., Friedenreich, C. M., Sela, R. A., Quinney, H. A., Rhodes, R. E., & Handman, M. (2003a). The group psychotherapy and home-based physical exercise (group-hope) trial in cancer survivors: physical fitness and quality of life outcomes. *Psycho-Oncology, 12,* 357-374.

Courneya, K. S., Karvinen, K. H., Campbell, K. L., Pearcey, R. G., Dundas, G., Capstick, V. et al. (2005). Associations among exercise, body weight, and quality of life in a population-based sample of endometrial cancer survivors. *Gynecologic Oncology, 97,* 422-430.

Courneya, K. S., Mackey, J. R., Bell, G. J., Jones, L. W., Field, C. J., & Fairey, A. S. (2003b). Randomized controlled trial of exercise training in postmenopausal breast survivors: cardioplumonary and quality of life outcomes. *Journal of Clinical Oncology, 21,* 1660-1668.

Cramp, F. & Daniel, J. (2008). Exercise for the management of cancer-related fatigue in adults. *Cochrane Database Systematic Reviews*.

Crews, D. J. L. M. R. & Landers, D. M. (2004). Aerobic physical activity effects on psychological well-being in low-income Hispanic children. *Perceptual and Motor Skills, 98,* 319-324.

Culos-Reed, S. N., Robinson, J. L., Lau, H., O'Connor, K., & Keats, M. R. (2007). Benefits of a physical activity intervention for men with prostate cancer. *Journal of Sport and Exercise Psychology, 29,* 118-127.

Culos-Reed, S. N., Robinson, J. W., Lau, H., Stephenson, L., Keats, M., Norris, S. et al. (2010). Physical activity for men receiving androgen deprivation therapy for prostate cancer: benefits from a 16-week intervention. *Supportive Care in Cancer, 18,* 591-599.

Demark-Wahnefried, W., Aziz, N. M., Rowland, J. H., & Pinto, B. M. (2005). Riding the crest of the teachable moment: promoting long-term health after the diagnosis of cancer. *Journal of Clinical Oncology, 23,* 5814-5830.

Demark-Wahnefried, W., Clipp, E. C., Morey, M. C., Pieper, C. F., Sloane, R., Snyder, D. C. et al. (2004). Physical function and associations with diet and exercise: Results of a cross-sectional survey among elders with breast or prostate cancer. *International Journal of Behavioral Nutrition and Physical Activity, 1,* 1-16.

Dimeo, F. (2001). Effects of exercise on cancer-related fatigue. *Cancer, 92,* 1693.

Dimeo, F., Rumberger, B. G., & Keul, J. (1998). Aerobic exercise as therapy for cancer fatigue. *Medicine Science of Sports and Exercise., 30,* 475-478.

Dunn, A. L. & Blair, S. N. (1997). *Physical activity and mental health*. Washington DC: Taylor & Francis.

Fossa, S. D. (2009). Medisinske problemer hos kreftoverlevere. In S.D.Fossa, J. H. Loge, & A. A. Dahl (Eds.), *Kreftoverlevere* (pp. 58-77). Oslo: Gyldendal Akademiske.

Fossa, S. D., Giercksky, K.-E., & Smeland, S. (2009). Oversikt over kreftbehandling og bivirkninger. In S.D.Fossa, J. H. Loge, & A. A. Dahl (Eds.), *Kreftoverlevere* (pp. 41-57). Oslo: Gyldendal Akademiske.

Friedenreich, C. M. & Thune, I. (2001). A review of physical activity and prostate cancer risk. *Cancer Causes and Control, 12,* 461-475.

Galvao, D. A., Nosaka, K., Taaffe, D. R., Spry, N., Kristjanson, L. J., McGuigan, M. R. et al. (2006). Resistance training and reduction of treatment side effects in prostate cancer patients. *Medicine and Science in Sports and Exercise, 38,* 2045-2052.

Galvao, D. A., Taaffe, D. R., Spry, N., Joseph, D., & Newton, R. U. (2010). Combined resistance and aerobic exercise program reverses muscle loss in men undergoing androgen suppression therapy for prostate cancer without bone metastases: a randomized controlled trial. *Journal of Clinical Oncology, 28,* 340-347.

Gionet, N. J. & Godin, G. (1989). Self-reported exercise behavior of employees: a validity study. *Journal of Occupational and Environmental Medicine, 31,* 969-973.

Gjerset, G. M., Fossa, S. D., Courneya, K. S., Skovlund, E., Jacobsen, A. B., & Thorsen, L. (2011). Interest and preferences for exercise counselling and

programming among Norwegian cancer survivors. *European Journal of Cancer, 20,* 96-105.

Gjerset, G. M., Fossa, S. D., Courneya, K. S., Skovlund, E., & Thorsen, L. (2011). Exercise behavior in cancer survivors and associated factors. *Journal of Cancer Survivorship, 5,* 35-43.

Glaus, A. (1998). Fatigue in patients with cancer. Analysis and assessment. *Recent Results in Cancer Research, 17,* 1-172.

Godin, G., Jobin, J., & Bouillon, J. (1986). Assessment of leisure time exercise behavior by self-report: a concurrent validity study. *Canadian Journal of Public Health, 77,* 359-362.

Godley, P. A. (1999). Prostate cancer screening: promise and peril--a review. *Cancer Detection and Prevention, 23,* 316-324.

Gutstein, H. B. (2001). The biologic basis of fatigue. *Cancer, 92,* 1678-1683.

Heidenreich, A., Aus, G., Bolla, M., Joniau, S., Matveev, V. B., Schmid, H. P. et al. (2009). [EAU guidelines on prostate cancer]. *Actas Urologicas Espanolas, 33,* 113-126.

Helsedirektoratet (2009). *Fysisk aktivitet blant voksne og eldre i Norge Resultater fra en kartlegging i 2008 og 2009*.

Hjermstad, M. J., Oldervoll, L., Fossa, S. D., Holte, H., Jacobsen, A. B., & Loge, J. H. (2006). Quality of life in long-term Hodgkin's disease survivors with chronic fatigue. *European Journal of Cancer, 42,* 327-333.

Hoffman, J. (2002). *Physiological Aspects of Sport Training and Performance*. Champaign: Human Kinetics.

Hofman, M., Ryan, J. L., Figueroa-Moseley, C. D., Jean-Pierre, P., & Morrow, G. R. (2007). Cancer-related fatigue: the scale of the problem. *Oncologist., 12 Suppl 1,* 4-10.

Irwin, M. L., Crumley, D., McTiernan, A., Bernstein, L., Baumgartner, R., Gilliland, F. D. et al. (2003). Physical activity levels before and after a diagnosis of breast carcinoma: the Health, Eating, Activity, and Lifestyle (HEAL) study. *Cancer, 97,* 1746-1757.

Iversen, J. R. & Berge, V. (2010). *Prostatakreft- til pasienter, pårørende og andre interesserte*. 4. Kreftforeningen.
Ref Type: Pamphlet

Jacobs, D. R., Jr., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine and Science in Sports and Exercise, 25,* 81-91.

Jereczek-Fossa, B. A., Marsiflia, H. R., & Orecchia, R. (2002). Radiotherapy-related fatigue. *Critical Reviews in Oncology/Hematology, 41,* 317-325.

Jones, L. W., Courneya, K. S., Vallance, J. K., Ladha, A. B., Mant, M. J., Belch, A. R. et al. (2004). Association between exercise and quality of life in multiple myeloma cancer survivors. *Supportive Care in Cancer, 12,* 780-788.

Karvinen, K. H., Courneya, K. S., North, S., & Venner, P. (2007). Associations between exercise and quality of life in bladder cancer survivors: a population-based study. *Cancer Epidemiology, Biomarkers and Prevention, 16,* 984-990.

Klepp, O. (2000). Svulster i mannlige genitalia. In Kåresen R & E. Wist (Eds.), *Kreftsykdommer. En basisbok for helsepersonell* (pp. 220-234). Oslo: Gyldendal Norsk Forlag.

Knols, R., Aaronson, N. K. U. D., Fransen, J., & Aufdemkampe, G. (2005). Physical exercise in cancer patients during and after medical treatment: a systematic review of randomized and controlled trials. *Journal of Clinical Oncology, 23,* 3830-3842.

Kruger, J. (2007). *Prevcalence of regular physical activity among adults--United States, 2001 and 2005.* Morbidity and Mortality Weekley Report: Centers for Disease Control and Prevention.

Lee, I. M. (2006). Physical Activity, Fitness, and Cancer. In C.Bouchard, S. N. Blair, & L. H. William (Eds.), *Physical Activity and Health* (Human Kinetics.

Lewis, G. & Wessely, S. (1992). The epidemiology of fatigue: more questions than answers. *Journal of Epidemiology and Community Health, 46,* 92-97.

Lewitt, P., Guralnick, E., Kagan, R., & Gilbert, H. (1980). *Boken om kreft*. Oslo: Universitetsforlaget.

Loge, J. H. (2009). Fatigue og depresjon. In S.D.Fossa, J. H. Loge, & A. A. Dahl (Eds.), *Kreftoverlevere* (pp. 97-112). Oslo: Gyldendal Norsk Forlag A/S.

Loge, J. H., Abrahamsen, A. F., Ekeberg, O., & Kaasa, S. (1999). Hodgkin's disease survivors more fatigued than the general population. *Journal of Clinical Oncology, 17,* 253-261.

Loge, J. H., Ekeberg, O., & Kaasa, S. (1998). Fatigue in the general Norwegian population: normative data and associations. *Journal of Psychosomatic Research, 45,* 53-65.

Lucia, A., Earnest, C., & Perez, M. (2003). Cancer-related fatigue: can exercise physiology assist oncologists? *The Lancet Oncology, 4,* 616-625.

Lynch, B. M., Cerin, E., Newman, B., & Owen, N. (2007). Physical activity, activity change, and their correlates in a population-based sample of colorectal cancer survivors. *Annals of Behavioral Medicine, 34,* 135-143.

Martinsen, E. W. (2000). Exercise for mental health. *Tidsskrift for Den Norske Lægeforening, 120,* 3056.

Martinsen, E. W., Hoffart, A., & Solberg, O. (1989). Comparing aerobic with nonaerobic forms of exercise in the treatment of clinical depression: a randomized trial. *Comprehensive Psychiatry, 30,* 324-331.

Martinsen, E. W., Medhus, A., & Sandvik, L. (1985). Effects of aerobic exercise on depression: a controlled study. *British Medical Journal (Clinical Research Ed.), 291,* 109.

McNeely, M. L. & Courneya, K. S. (2010). Exercise programs for cancer-related fatigue: evidence and clinical guidelines. *Journal of the National Comprehensive Cancer Network, 8,* 945-953.

Mock, V. (2001). Fatigue management: evidence and guidelines for practice. *Cancer, 92,* 1699-1707.

Mock, V. (2003). Cancer-related fatigue. In C.W.Given, V. L. Given, S. Champion, S. Kozachik, & D. N. DeVoss (Eds.), *Evidence-based cancer care and prevention: behavioral interventions* (pp. 242-273). New York: Springer.

Mock, V. & Olsen, M. (2003). Current management of fatigue and anemia in patients with cancer. *Seminars in Oncology Nursing, 19,* 36-41.

Møller, B. & Langmark, F. (2009). Kretoverlevere i tall. In S.D.Fossa, J. H. Loge, & A. A. Dahl (Eds.), *Kreftoverlevere* (pp. 30-40). Oslo: Gyldendal Akademiske.

Nail, L. M., Jones, L. S., Greene, D., Schipper, D. L., & Jensen, R. (1991). Use and perceived efficacy of self-care activities in patients receiving chemotherapy. *Oncology Nursing Forum, 18,* 883-887.

Nasjonalt Råd for Fysisk aktivitet (2011). *Fysisk aktivitet; omfagn, tilrettelegging og sosial ulikhet.* Oslo: Nasjonalt Råd for Fysisk Aktivitet.

National Comprehensive Cancer Network. (2006). Clinical practice guidelines in oncology: Cancer-related fatigue. www.nccn.org . 7-2-2011.
Ref Type: Online Source

National Comprehensive Cancer Network. (2011). *NCCN guidelines version 1.2011 Prostate Cancer*. www.nccn.org . 7-2-2011.
Ref Type: Pamphlet

Ohira, T., Schmitz, K. H., Ahmed, R. L., & Yee, D. (2006). Effects of weight training on quality of life in recent breast cancer survivors. *Cancer, 106,* 2076-2083.

Oldervoll, L. M., Loge, J. H., Kaasa, S., Lydersen, S., Hjermstad, M. J., Thorsen, L. et al. (2007). Physical activity in Hodgkin's lymphoma survivors with and without chronic fatigue compared with the general population - a cross-sectional study. *BMC.Cancer, 7,* 210.

Peddle, C. J., Au, H. J., & Courneya, K. S. (2008). Associations between exercise, quality of life, and fatigue in colorectal cancer survivors. *Diseases of the Colon and Rectum, 51,* 1242-1248.

Penson, D. F. & Chan, J. M. (2007). Prostate cancer. *Journal of Urology, 177,* 2020-2029.

Portenoy, R. K. & Itri, L. M. (1999). Cancer-related fatigue: guidelines for evaluation and management. *Oncologist., 4,* 1-10.

Rauh, M. J., Hovell, M. F., Hofstetter, C. R., Sallis, J. F., & Gleghorn, A. (1992). Reliability and validity of self-reported physical activity in Latinos. *Internal Journal of Epidemiology, 21,* 966-971.

Rothman, K. (2002). *Epiodemiology- An Introduction*. New York: Oxford University Press.

Rothman, K. J. & Greenland, S. (1998). *Modern Epidemiology*. (2 ed.) Philadelphia: Lippicott Williams & Wilkins.

Schmitz, K. H., Courneya, K. S., Matthews, C. E., Demark-Wahnefried, W., Galvao, D. A., Pinto, B. M. et al. (2010). American College of Sports Medicine Roundtable on Exercise Guidelines for Cancer Survivors. *Medicine & Science in Sports & Exercise, 10,* 1409-1426.

Schmitz, K. H., Holtzman, J., Courneya, K. S., Masse, L. C., Duval, S., & Kane, R. (2005). Controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. *Cancer Epidemiology, Biomarkers and Prevention, 14,* 1588-1595.

Schwartz, A. L., Mori, M., Gao, R., Nail, L. M., & King, M. E. (2001). Exercise reduces daily fatigue in women with breast cancer receiving chemotherapy. *Medicine and Science in Sports and Exercise, 33,* 718-723.

Segal, R. J., Reid, R. D., Courneya, K. S., Malone, S. C., Parliament, M. B., Scott, C. G. et al. (2003). Resistance exercise in men receiving androgen deprivation therapy for prostate cancer. *Journal of Clinical Oncology, 21,* 1653-1659.

Segal, R. J., Reid, R. D., Courneya, K. S., Sigal, R. J., Kenny, G. P., Prud'Homme, D. G. et al. (2009). Randomized controlled trial of resistance or aerobic exercise in men receiving radiation therapy for prostate cancer. *Journal of Clinical Oncology, 27,* 344-351.

Speck, R. M., Courneya, K. S., Masse, L. C., Duval, S., & Schmitz, K. H. (2010). An update of controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. *Journal of Cancer Survivorship, 4,* 87-100.

Spence, R. R., Heesch, K. C., & Brown, W. J. (2010). Exercise and cancer rehabilitation: a systematic review. *Cancer Treatment Reviews, 36,* 185-194.

Statistisk sentralbyrå. (2005). *Færre dør av hjerte-karsykdommer*. http://ssb.no/vis/emner/03/01/10/dodsarsak/main.html.

Ref Type: Online Source

Stone, P. (2002). The measurement, causes and effective management of cancer-related fatigue. *International Journal of Palliative Nursing, 8,* 120-128.

Strauss, S. (2006). Chronic Fatigue Syndrome. In D.F.A.L.D.B.E.H.S.J.J.Kasper (Ed.), *Harrison's Principles of Internal Medicine* (pp. 2804-2805). Barcelona: McGraw Hill.

Stricker, C. T., Drake, D., Hoyer, K. A., & Mock, V. (2004). Evidence-based practice for fatigue management in adults with cancer: exercise as an intervention. *Oncology Nursing Forum, 31,* 963-976.

Thomas, J. R. & Nelson, J. K. (2001). *Research methods in physical activity*. (5 ed.) Champaign: Human Kinetics.

Thorsen, L. (2009). Fysisk aktivitet og røyking. In S.D.Fosså, J. H. Loge, & A. A. Dahl (Eds.), *Kreftoverlevere* (pp. 188-201). Oslo: Gyldendal akademisk.

Thorsen, L., Courneya, K. S., Stevinson, C., & Fossa, S. D. (2008). A systematic review of physical activity in prostate cancer survivors: outcomes, prevalence, and determinants. *Supportive Care in Cancer, 16,* 987-997.

Thorsen, L., Nystad, W., Dahl, A. A., Klepp, O., Bremnes, R. M., Wist, E. et al. (2003a). The level of physical activity in long-term survivors of testicular cancer. *European Journal of Cancer, 39,* 1216-1221.

Thorsen, L., Skovlund, E., Strømme, S. B., Hornslien, K., Dahl, A. A., & Fossa, S. D. (2003b). Effectiveness of Physical Activity on Cardiorespiratory Fitness and Health-Related Quality of Life in Young and Middle-Aged Cancer Patients Shortly After Chemotherapy. *Journal of Clinical Oncology, 10,* 2378-2388.

Thune, I. & Smeland, S. (2000a). Could physical activity prevent cancer? [In Norwegian]. *Tidsskrift for Den Norske Lægeforening, 27,* 3296-3301.

Thune, I. & Smeland, S. (2000b). Is physical activity important in the treatment and rehabilitation of cancer patients? [In Norwegian]. *Tidsskrift for Den Norske Lægeforening, 27,* 3302-3304.

Tretli.S. (2000a). Forekomst av kreft. In Kåresen R & E. Wist (Eds.), *Kreftsykdommer. En basisbok for helsepersonell* . Oslo: Gyldendal Norsk forlag.

Tretli.S. (2000b). Risikofaktorer og forebygging. In Kåresen R & E. Wist (Eds.), *Kreftsykdommer. En basisbok for helsepersonell* . Oslo: Gyldendal Norsk Forlag.

Troiano, R. P. (2007). Large-scale applications of accelerometers: new frontiers and new questions. *Medicine and Science in Sports and Exercise, 39,* 1501.

U.S.Department of Health and Human Services. (2008). *2008 Physical Activity Guidelines for Americans. Be active, healthy, and happy!* Public Health Service.

Vallance, J. K., Courneya, K. S., Jones, L. W., & Reiman, T. (2005). Differences in quality of life between non-Hodgkin's lymphoma survivors meeting and not meeting public health exercise guidelines. *Psycho-Oncology, 14,* 979-991.

Verhagen, E. A. L. M., Sluijs, S. M. F., & Mechelen, W. v. (2007). Risks of Physical Activity. In C.Bouchard, S. N. Blair, & W. L. Haskell (Eds.), *Physical Activity and Health* (3 ed., pp. 287-300). Champaign: Human Kinetics.

Vogelzang, N. J., Breitbart, W., Cella, D., Curt, G. A., Groopman, J. E., Horning, S. J. et al. (1997). Patient, caregiver, and oncologist perceptions of cancer-related

fatigue: results of a tripart assessment survey. The Fatigue Coalition. *Seminars in Hematology, 34,* 4-12.

Wagner, L. I. & Cella, D. (2004). Fatigue and cancer: causes, prevalence and treatment approaches. *British Journal of Cancer, 91,* 822-828.

Wessely, S. (1992). The measurement of fatigue and chronic fatigue syndrome. *Journal of the Royal Society of Medicine, 85,* 189-190.

Wessely, S. (1998). The epidemiology of chronic fatigue syndrome. *Epidemiologia e Psichiatria Sociale, 7,* 10-24.

Windsor, P. M., Nicol, K. F., & Potter, J. (2004). A randomized, controlled trial of aerobic exercise for treatment-related fatigue in men receiving radical external beam radiotherapy for localized prostate carcinoma. *Cancer, 101,* 550-557.

World Health Organization (2010). *International union against cancer*. www.who.int [On-line].

11. Appendix

Appendix 1	Fatigue Questionnaire
Appendix 2	Godin Leisure Time Exercise Questionnaire (Question 25 & 27)
Appendix 3	Health variables (Question 1,3,4,8,9,11,12,13,14 & 22)
Appendix 4	Information letter
Appendix 5	Consent form

Fatigue (tretthet)

Pasient nr.: ☐☐☐☐ Dato for utfylling: ☐☐ . ☐☐ . ☐☐☐☐

Vi vil gjerne vite om du har følt deg sliten, svak eller i mangel av overskudd den siste måneden. Vennligst besvar ALLE spørsmålene ved å krysse av [X] for det svaret du synes passer best for deg. Vi ønsker at du besvarer alle spørsmålene selv om du ikke har hatt slike problemer. Vi spør om hvordan du har følt deg i det siste og ikke om hvordan du følte deg for lenge siden. Hvis du har følt deg sliten lenge, ber vi om at du sammenlikner deg med hvordan du følte deg sist du var bra. (Ett kryss på hver linje)

---

1. Har du problemer med at du føler deg sliten?	☐ Mindre enn vanlig	☐ Ikke mer enn vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
2. Trenger du mer hvile?	☐ Nei, mindre enn vanlig	☐ Ikke mer enn vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
3. Føler du deg søvnig eller døsig?	☐ Mindre enn vanlig	☐ Ikke mer enn vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
4. Har du problemer med å komme igang med ting?	☐ Mindre enn vanlig	☐ Ikke mer enn vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
5. Mangler du overskudd?	☐ Ikke i det hele tatt	☐ Ikke mer enn vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
6. Har du redusert styrke i musklene dine?	☐ Ikke i det hele tatt	☐ Ikke mer enn vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
7. Føler du deg svak?	☐ Mindre enn vanlig	☐ Som vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
8. Har du vansker med å konsentrere deg?	☐ Mindre enn vanlig	☐ Som vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
9. Forsnakker du deg i samtaler?	☐ Mindre enn vanlig	☐ Ikke mer enn vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
10. Er det vanskeligere å finne det rette ordet?	☐ Mindre enn vanlig	☐ Ikke mer enn vanlig	☐ Mer enn vanlig	☐ Mye mer enn vanlig
11. Hvordan er hukommelsen din?	☐ Bedre enn vanlig	☐ Ikke verre enn vanlig	☐ Verre enn vanlig	☐ Mye verre enn vanlig

12. Hvis du føler deg sliten for tiden, omtrent hvor lenge har det vart?

☐ Mindre enn en uke ☐ Mindre enn tre måneder ☐ Mellom tre og seks måneder ☐ Seks måneder eller mer

13. Hvis du føler deg sliten for tiden, omtrent hvor mye av tiden kjenner du det?

☐ ☐ ☐

23. Har du noen langvarig sykdom, skade eller lidelse av *psykisk art* som nedsetter dine funksjoner i ditt daglige liv? (langvarig = minst ett år)

☐ Ja ☐ Nei

BRUK AV HELSETJENESTER

24. Har du i løpet av de siste 12 månedene vært hos:

a)Allmennpraktiserende lege (kommune-lege, privat lege, turnuskandidat)	☐ Ja	☐ Nei
b)Bedriftslege	☐ Ja	☐ Nei
c)Lege ved sykehus (uten innleggelse)	☐ Ja	☐ Nei
d)Annen lege	☐ Ja	☐ Nei
e)Fysioterapeut	☐ Ja	☐ Nei
f)Kiropraktor	☐ Ja	☐ Nei
g)Homøopat	☐ Ja	☐ Nei
h) Annen behandler (naturmedisiner, fotsoneterapeut, håndspålegger, "healer" el.l.)	☐ Ja	☐ Nei

TRENING I FRITIDEN

Når du skal svare på de neste tre spørsmålene, ber vi deg tenke på din gjennomsnittlige ukentlige trening **i månedene før du fikk din kreftdiagnose, i den tiden du fikk behandling og i løpet av den siste måneden.**

Når du svarer på spørsmålene under skal du merke deg følgende:
- Ta bare med treningsøkter som varte 10 minutter eller lenger
- Ta bare med trening du har gjort i løpet av fritiden (altså ikke i arbeidstiden eller husarbeid)
- Merk deg at hovedforskjellen mellom de tre treningskategoriene er intensiteten
- Skriv ned hvor mange ganger per uke i gjennomsnitt du gjorde en aktivitet i første kolonne, og hvor lenge du holdt på per gang i gjennomsnitt på andre kolonne.

25. Tenk tilbake på din gjennomsnittlige ukentlige trening **i månedene før du fikk din kreftdiagnose**. Hvor mange ganger i løpet av en vanlig syvdagersuke gjennomførte du følgende trening:

a) HARD TRENING
(VELDIG ANSTRENGENDE, HJERTE SLÅR FORT)
(f.eks. løping, jobbing, ishockey, fotball, squash, basketball, skigåing, judo, rulleskøyter, rask svømming, rask sykling over lange avstander)

a1) Ganger per uke i gjennomsnitt

a2) Hvor lenge per gang i gjennomsnitt (antall min.)

b) MODERAT TRENING
(MODERAT ANSTRENGENDE)
(f.eks. rask gange, tennis, lett sykling, volleyball, badminton, rolig svømming, slalåm, folkedans)

b1) Ganger per uke i gjennomsnitt

b2) Hvor lenge per gang i gjennomsnitt (antall min.)

c) LETT TRENING
(MINIMALT ANSTRENGENDE)
(f.eks. lett gange, yoga, bueskytting, fiske, bowling, golf, snøscooterkjøring)

c1) Ganger per uke i gjennomsnitt

c2) Hvor lenge per gang i gjennomsnitt (antall min.)

26. Tenk tilbake på din gjennomsnittlige ukentlige trening **i den tiden du fikk behandling** (for eksempel strålebehandling, cellegiftbehandling eller hormon-behandling). Hvor mange ganger i løpet av en vanlig syvdagersuke gjennomførte du følgende trening:

a) HARD TRENING
(VELDIG ANSTRENGENDE, HJERTE SLÅR FORT)
(f.eks. løping, jobbing, ishockey, fotball, squash, basketball, skigåing, judo, rulleskøyter, rask svømming, rask sykling over lange avstander)

a1) Ganger per uke i gjennomsnitt

a2) Hvor lenge per gang i gjennomsnitt (antall min.)

b) MODERAT TRENING (MODERAT ANSTRENGENDE) (f.eks. rask gange, tennis, lett sykling, volleyball, badminton, rolig svømming, slalåm, folkedans)

b1) Ganger per uke i gjennomsnitt

b2) Hvor lenge per gang i gjennomsnitt (antall min.)

c) LETT TRENING
(MINIMALT ANSTRENGENDE)
(f.eks. lett gange, yoga, bueskytting, fiske, bowling, golf, snøscooterkjøring)

c1) Ganger per uke i gjennomsnitt

c2) Hvor lenge per gang i gjennomsnitt (antall min.)

27. Tenk tilbake på din gjennomsnittlige ukentlige trening **den siste måneden**. Hvor mange ganger i løpet av en vanlig syvdagersuke gjennomførte du følgende trening:

a) HARD TRENING
(VELDIG ANSTRENGENDE, HJERTE SLÅR FORT)
(f.eks. løping, jobbing, ishockey, fotball, squash, basketball, skigåing, judo, rulleskøyter, rask svømming, rask sykling over lange avstander)

a1) Ganger per uke i gjennomsnitt

a2) Hvor lenge per gang i gjennomsnitt (antall min.)

b) MODERAT TRENING (MODERAT ANSTRENGENDE) (f.eks. rask gange, tennis, lett sykling, volleyball, badminton, rolig svømming, slalåm, folkedans)

b1) Ganger per uke i gjennomsnitt

b2) Hvor lenge per gang i gjennomsnitt (antall min.)

c) LETT TRENING
(MINIMALT ANSTRENGENDE)
(f.eks. lett gange, yoga, bueskytting, fiske, bowling, golf, snøscooterkjøring)

c1) Ganger per uke i gjennomsnitt

c2) Hvor lenge per gang i gjennomsnitt (antall min.)

7624

Pasient nr.: ☐☐☐☐

Spørreskjema

Dato for utfylling: ☐☐.☐☐.☐☐☐☐ Høyde: ☐☐☐ cm Vekt: ☐☐☐ kg

SIVIL STATUS

1. Hva er din nåværende sivilstatus?
(Kryss av ved det svaret som passer)

☐ Aldri vært gift

☐ Gift/samboende

☐ Enkemann/enke

☐ Separert/skilt

BARN

2. a) Har du barn? ☐ Ja ☐ Nei

b) Hvis ja, hvor mange? ☐☐

c) Hvor mange av disse bor hjemme? ☐☐

ARBEID OG UTDANNING

3. Hvilken utdanning er den høyeste du har fullført?

☐ Grunnskole 7-10 år, framhaldskole, folkehøgskole

☐ Realskole, middelskole, yrkesskole 1-2 årig videregående skole

☐ Artium, øk. gymnas, allmennfaglig retning i videregående skole

☐ Høgskole/universitet mindre enn 4 år

☐ Høgskole/universitet 4 år eller mer

4. Hva er din nåværende arbeidssituasjon?

☐ Arbeidsledig/permittert

☐ Sykemeldt

☐ Attføring

☐ Uføretrygdet

☐ Delvis i arbeid

☐ I fullt arbeid

☐ Alderspensjonist Utdanning,

☐ militærtjeneste

☐ Hjemmeværende/ husarbeid

5. Hvis du er i lønnet eller ulønnet arbeid:
Hvordan vil du beskrive arbeidet ditt?
(Sett bare ett kryss)

☐ For det meste stillesittende arbeid (f.eks. skrivebordsarb., montering)

☐ Arbeid som krever at du går mye (f.eks. ekspeditørarbeid, lett industriarb., undervisning)

☐ Arbeid hvor du går og løfter mye (f.eks. postbud, pleier, bygningsarbeider)

☐ Tungt kroppsarbeid (f.eks. skogsarbeid, tungt jordbruksarbeid, bygningsarbeid)

SYKEFRAVÆR

Hvis du for tiden ikke har inntektsgivende arbeid eller du ikke har heltids husarbeid: Gå videre til spørsmål 8

6. Har du i løpet av de siste 12 månedene hatt sykefravær?

a)Med egenmelding ☐ Ja ☐ Nei

b)Med sykemelding fra lege ☐ Ja ☐ Nei

7. Hvis ja, hvor lenge tilsammen?

☐ 2 uker eller mindre
☐ 2-7 uker
☐ 2-4 måneder
☐ 4-6 måneder
☐ 6 måneder eller mer

RØYKING

8. Røyker du sigaretter/ sigarer/ sigarillos eller pipe?

a)Ja, daglig ☐
b)Ja, av og til ☐
c) Nei, jeg røkte tidligere men har sluttet ☐
d) Nei, jeg har aldri røkt ☐

SYKDOM/ PLAGER

9. Når fikk du din kreftdiagnose (måned/ år)?

☐☐ - ☐☐☐☐

10. a) Har du fått tilbakefall av din kreftsykdom?

☐ Ja ☐ Nei

b) Hvis ja, når?
Første gang (måned/ år)?

☐☐ - ☐☐☐☐

c) Eventuelt andre gang (måned/ år)?

☐☐ - ☐☐☐☐

11 a) Er du operert?

☐ Ja ☐ Nei

b)Hvis ja, når (måned/ år)?

☐☐ - ☐☐☐☐

12 a) Har du fått cellegiftbehandling?

☐ Ja ☐ Nei

b)Hvis ja, når fikk du siste kur (måned/ år)?

☐☐ - ☐☐☐☐

13 a) Har du fått strålebehandling?

☐ Ja ☐ Nei

b)Hvis ja, når avsluttet du behandlingen (måned/ år)?

☐☐ - ☐☐☐☐

14 a) Har du fått hormonbehandling?

☐ Ja ☐ Nei

b)Hvis ja, når avsluttet du behandlingen (måned/ år)?

☐☐ - ☐☐☐☐

I noen av de følgende spørsmål ber vi deg å oppgi alderen din da eventuelle andre sykdommer inntrådte. Hvis du ikke husker nøyaktig hvor gammel du var, skriver du et tall som er nærmest det du antar er korrekt. Kryss av for det svaret som passer.

15. Har du eller har du hatt:

	Ja	Nei	Alder første gang
a)Hjerteinfarkt	☐	☐	☐☐ år
b)Angina pectoris/ hjertekrampe	☐	☐	☐☐ år
c)Hjerneslag/ hjerneblødning	☐	☐	☐☐ år
d)Diabetes (sukkersyke)	☐	☐	☐☐ år
e)Astma	☐	☐	☐☐ år

16. Har legen din noen gang sagt at du har/ har hatt noen av disse sykdommene?

a) Beinskjørhet (osteoporose) ☐ Ja ☐ Nei

b) Fibromyalgi (fibrositt/ kronisk smertesyndrom) ☐ Ja ☐ Nei

c) Slitasjegikt (artrose) ☐ Ja ☐ Nei

d) Andre langvarige skjelett- eller muskelsykdommer ☐ Ja ☐ Nei

17. Har du iløpet av det siste året vært plaget med smerter og/ eller stivhet i muskler og ledd som har vart i minst 3 måneder sammenhengende?

☐ Ja ☐ Nei

Hvis "nei", gå til spørsmål nr. 20

18. Hvor har du hatt disse plagene?

a) Nakke ☐ Ja ☐ Nei

b) Skuldre (aksler) ☐ Ja ☐ Nei

c) Albuer ☐ Ja ☐ Nei

d) Håndledd, hender ☐ Ja ☐ Nei

e) Bryst/ mage ☐ Ja ☐ Nei

f) Øvre del av rygg ☐ Ja ☐ Nei

g) Korsrygg ☐ Ja ☐ Nei

h) Hofter ☐ Ja ☐ Nei

i) Knær ☐ Ja ☐ Nei

j) Ankler, føtter ☐ Ja ☐ Nei

k) Hvis du har hatt plager i flere områder i minst tre måneder det siste året, noter hvor plagene har vart lengst:

19. Har disse plagene redusert din arbeidsevne det siste året? (Gjelder også hjemmeværende)

☐ Nei/ ubetydelig

☐ I noen grad

☐ I betydelig grad

☐ Vet ikke

20 a)Er du plaget av stikkende/ prikkende/ brennende smerter og/ eller nummenhet i hender og føtter?

☐ Ja ☐ Nei

b)Hvis ja, har disse plagene hindret deg i å delta i fysisk aktivitet?

☐ Ja ☐ Nei ☐ Delvis

21 a) Har du som følge av kreftsykdommen eller kreft-behandlingen hatt spesielle funksjonsproblem med behov for fysikalsk behandling? (eks. Plager med armfunksjon eller hevelse i armen etter operasjon for brystkreft, plager med urinlekkasje eller lekkasje av luft eller avføring etter behandling for prostatakreft, tarmkreft eller underlivskreft, andre plager med fysisk funksjon)

☐ Ja ☐ Nei

b)Hvis ja, har disse plagene hindret deg i å delta i fysisk aktivitet?

☐ Ja ☐ Nei ☐ Delvis

22. Har du noen langvarig sykdom, skade eller lidelse av *fysisk art* som nedsetter dine funksjoner i ditt daglige liv? (langvarig = minst ett år)

☐ Ja ☐ Nei

Studiens navn: Behov og preferanser knyttet til treningsveiledning hos kreftpasienter i Norge

Forespørsel om deltagelse i forskningsprosjekt.

Vi vet lite om hvilke behov kreftpasienter har for treningsveiledning under behandling og i tiden etter. Det er i denne forbindelse vi nå tar kontakt med tidligere pasienter som har fått behandling ved Rikshospitalet – Radiumhospitalet HF. Vi spør med dette om dere vil delta i en spørreskjemaundersøkelse om hvilke behov og preferanser dere har hatt for treningsveiledning under og etter behandling. I tillegg stiller vi en del spørsmål om deres aktivitetsnivå, livskvalitet og generelle helse.

Vi håper denne undersøkelsen vil gi oss svar på hvor mange og hvilke kreftpasienter som trenger treningsveiledning, og hvordan treningsprogrammene bør tilrettelegges ut fra deres behov. Kunnskap om dette kan danne grunnlag for fremtidige planer om fysisk rehabilitering for kreftpasienter i Norge.

Undersøkelsen er basert på frivillighet. Dersom du velger å delta kan du trekke din besvarelse fra undersøkelsen når som helst og uten å oppgi grunn. Om du ikke ønsker å delta eller senere velger å trekke deg, vil dette ikke ha konsekvenser for ditt nåværende eller eventuelle fremtidige forhold til sykehuset.

I forbindelse med studien vil det bli laget et eget register som ligger på Radiumhospitalet. Dette gjøres for å kunne analysere resultatene på en rask og effektiv måte. Registeret vil bare være tilgjengelig for prosjektleder og medarbeidere, og vil bli slettet/ anonymisert i løpet av 2008. Rikshospitalet – Radiumhospitalet HF er ansvarlig for behandling og sikring av dataene. Du har rett til innsyn i hva som er registrert om deg. Dersom du ønsker å trekke deg fra studien vil alle opplysninger om deg slettes fra registeret. Resultatene av undersøkelsen vil bli behandlet konfidensielt, deltagerne vil ikke være identifiserbare ved databehandlingen og i publikasjonene vil alle data være anonymisert.

Det gjøres oppmerksom på at legen som er knyttet til prosjektet vil koble de opplysninger du gir gjennom spørreskjema til medisinske data som blant annet diagnose og behandling fra sykehusjournalen din. Alle opplysninger i journalen er underlagt taushetsplikt i henhold til Helsepersonelloven.

Undersøkelsen er lagt frem for Regional komité for medisinsk forskningsetikk, Sør-Norge, som tilrår studien.

Dersom du er villig til å delta i undersøkelsen ber vi deg undertegne samtykkeerklæringen og returnere denne sammen med ferdig utfylt spørreskjema i vedlagte frankerte svarkonvolutt.

Dersom du har spørsmål om undersøkelsen kan disse rettes til prosjektmedarbeider på telefon: 22 93 55 05

Med vennlig hilsen

Lene Thorsen	Sophie D. Fosså	Gunhild M. Gjerset
Prosjektleder, PhD	Overlege, Prof. Dr.med.	Prosjektmedarbeider, Cand Scient

Samtykkeerklæring

Jeg har lest informasjonen om undersøkelsen "Behov og preferanser knyttet til treningsveiledning hos kreftpasienter i Norge".

Ja ☐

Jeg er oppmerksom på at legen som er knyttet til prosjektet vil koble de opplysningene jeg gir om meg selv i forbindelse med spørreskjemaundersøkelsen til medisinske data fra sykehusjournalen min.

Ja ☐

Jeg er klar over at dataene som innhentes om meg vil bli lagt inn i et eget register. Registeret vil bare være tilgjengelig for prosjektleder og medarbeidere, og vil bli slettet/anonymisert i 2008.

Ja ☐

Jeg ønsker å delta i spørreundersøkelsen og er klar over at mitt samtykke ikke hindrer meg i å trekke meg fra undersøkelsen på hvilket som helst tidspunkt, og at alle opplysninger om meg da vil slettes fra dataregisteret.

Ja, jeg er villig til å delta under de gitte forutsetninger. ☐

Dato: _____

Underskrift:_____