Nutritional status, physical condition, motivation and ability for physical exercise in lung cancer patients at the start of chemotherapy

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Bachelor Nutrition and Dietetics
Nutritional status, physical condition, motivation and ability for physical exercise in lung cancer patients at the start of chemotherapy

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Foreword

This article is written as part of our graduation project for the Bachelor Nutrition and Dietetics at the Hogeschool van Amsterdam, University of Applied Sciences. On commission of the department of Dietetics at the VU medical center, data was collected on lung cancer patients.

We would like to thank the following people for their assistance and cooperation during our graduation period. With special thanks to our practice supervisor, Barbara S. van der Meij, of the department Dietetics at the VU medical Center, for her guidance, support and feedback. Also our special thanks to our teacher tutors Ljiljana Stanic-Jovic and Minse J.J. Boskuil. We would also like to thank the department Nutrition and Dietetics and other employees at the VU medical center, who guided us during our thesis. Without them, the realization of this thesis would have been impossible.

G. Ünver and M.A. Chung
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Abstract

Objective: Lung cancer patients are often malnourished and may lack physical condition and exercise during chemotherapy. The objective of this pilot study was to obtain data on nutritional status, physical condition, motivation and ability for a physical exercise program in patients with lung cancer, at the start of chemotherapy.

Materials and methods: Patients with any type and stage of lung cancer starting with chemotherapy at the VU University Medical Center were approached. Malnutrition was defined as BMI < 18.5 (age ≤ 65) or < 20 kg/m² (age > 65), weight loss > 5% in the previous month or > 10% in the previous 6 months. Fat free mass index (FFMI), hand grip strength and WHO performance score were assessed. Energy intake and protein intake were calculated from 24-h recalls. Patients filled out questionnaires on global health status and physical function (EORTC QLQ-C30) and exercise beliefs, ASE, and visual analogue scales (VAS) on fatigue and appetite. Subgroup differences were analysed by independent and one sample t-tests or chi-square tests, with \( \alpha = 0.05 \).

Results: Nineteen lung cancer patients (stage I to IV) were included; 16% had a WHO performance score 3 or 4, 26% was malnourished and FFMI was below the 5th percentile in 26%. Hand grip strength was on average 113.7 ± 22.9 % of reference values. Energy intake and protein intake were respectively, 88.4 ± 24.3% of TEE and 1.0 ± 0.4 g/kg/d. Fifty-three percent had had a decreased appetite (VAS < 5) (mean appetite: 5.5 ± 2.9) and 32% experienced fatigue (VAS > 5) (mean fatigue: 4.3 ± 2.6). Global health status and physical function, as compared with the general population, were both reduced in 63%. Motivation and ability to participate in a physical exercise program during chemotherapy were respectively 53% and 37%. Patients who were more motivated and able to participate in a physical exercise program, had a higher global health status (\( P < 0.01 \)).

Conclusion: This pilot study shows that a minority of lung cancer patients is malnourished and experiences a reduced performance status. About one third of patients, in particular those with a better global health status, is motivated and expects to be able to follow a physical exercise program during chemotherapy.

Keywords: lung cancer, performance status, global health status, physical exercise program, malnutrition
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Introduction

Lung cancer is one of the most common types of cancer throughout the world. The worldwide prevalence of lung cancer is approximately 12.4% of all cancers diagnosed. Each year, around 1.35 million people are (newly) diagnosed with lung cancer, and almost 1.2 million die from lung cancer. A peak in incidence was observed in Western and Northern Europe and the United States in 2008 (1). In the Netherlands each year about 10,000 people are newly diagnosed with lung cancer (2).

Lung cancer can be generally classified into two types, which are non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). These types are differentiated by cell type and biological behaviour of the cells. NSCLC accounts for 85% of all lung cancers (3). The severity of lung cancer is commonly classified into four stages (I to IV) (4), determined by the tumour-node-metastasis International Staging System for Lung Cancer (5). These classifications are also important to determine the most appropriate treatment for each patient, which can be curative or palliative, and may consist of chemotherapy, radiotherapy, or chemoradiotherapy, either or not combined with surgery (4).

Symptoms of lung cancer include general complaints, such as dyspnoea, haemoptysis and persistent cough. Cooley et al. reported that pain, dyspnoea and anorexia are the most common and most severe symptoms experienced by patients with advanced lung cancer (stage III and IV) (6). During treatment, patients may experience more complaints (i.e. nausea, vomiting and taste alterations), due to the side effects of chemotherapy and radiotherapy. Together with the disease-related anorexia and fatigue, energy intake is often reduced. With a stable or increased energy expenditure, a reduction of energy intake results in a negative energy balance and subsequently in weight loss and malnutrition (7). Moreover, hyper metabolism and systemic inflammation, induced by tumour products and pro-inflammatory cytokines, may lead to the Cancer Cachexia Syndrome (CCS). The CCS is characterized by progressive weight loss, depletion of muscle stores and increased energy expenditure (9-11), and is often observed in patients with lung cancer (8). The prevalence of weight loss and malnutrition in lung cancer varies from 35 to 76%, and depends on the stage of the disease and type of treatment (12-18).

Malnutrition in patients with cancer may be associated with complications or reduced survival rate. A few studies in patients with lung cancer showed the prognostic impact of body weight loss. Survival and chemotherapy response rates were decreased in general cancer patients experiencing > 5% weight loss (12;19).
In addition, patients with any weight loss showed more symptoms (i.e. anaemia), a longer duration of chemotherapy, and fewer symptomatic responses to chemotherapy than those with a stable body weight (16). Lung cancer patients can also be limited in several physical functions; they often experience fatigue, loss of appetite, weight loss and muscle wasting, leading to overall weakness and deterioration of the physical condition (12-18).

The last years, research on physical exercise programs during cancer treatment (chemotherapy and radiotherapy) is emerging. The aim of physical exercise programs is to maintain physical performance and muscle mass, and ultimately, to reduce fatigue and to improve quality of life. Overall, a number of studies showed positive effects of physical exercise interventions on fatigue, physical performance and quality of life during chemotherapy and radiotherapy in patients with various types of cancer (20-23).

However, only 2 studies investigated the feasibility of physical exercise programs, and showed that only 44% of lung cancer patients and 46% of mixed cancer patients managed to complete an exercise program during chemotherapy. Reasons for dropout were that patients reported to feel weakened or unwell (24;25).

So far, it is unknown which patients with lung cancer are eligible and motivated to participate in a physical exercise program during cancer treatment. Probably, patients with a better performance status (WHO) are more able to participate. Moreover, it is not clear which physical exercise program would be feasible for patients with advanced stages (III and IV) of lung cancer.

Apart from physical exercise programs, nutritional interventions consist of optimizing energy- and protein intake, and aim to maintain body weight, muscle mass and physical function (26;27). Studies on nutritional interventions in patients with head and neck cancer showed improvement of nutritional status and quality of life (28,29). Other studies showed nutritional interventions to be less effective in maintaining body weight, muscle mass and physical function in general cancer patients, due to cachexia (16;30). In this light, the combination intervention of concurrent exercise and nutrition might be more effective (31). Until now, the effects of these combined interventions have not been studied in patients with any type of cancer.

The aim of this pilot study was to explore nutritional status, physical condition, motivation and ability for a physical exercise program in lung cancer patients at the start of chemotherapy in the VU University Medical Center. The results could be used for the design of a (future) clinical trial to investigate the effect of a combined nutritional- and exercise intervention in patients with lung cancer.
Patients and study design
In this pilot study, patients with any type and stage of lung cancer, age 18 to 80 years, starting with chemotherapy and/or radiotherapy, and able to speak Dutch, were asked to participate. Patients who had undergone cancer treatment (chemotherapy, radiotherapy and/or surgery) in the previous month were excluded.

Preparation, approach and participation
This pilot study was conducted during 3 months (September to December 2011). During this period, the nurse practitioner of the department of pulmonary diseases announced eligible patients to the research assistants. When admitted to the VU University Medical Center (hospital or outpatient clinic), the research assistants approached these patients for assessment prior to chemotherapy infusion.

The Medical Ethical Committee of the VU University Medical Center approved the study protocol and all participants provided a written informed consent.

Measurements/ Assessments
The participants were evaluated on nutritional status parameters, fat free mass index (FFMI), hand grip strength, global health status, performance status, motivation and ability for a physical exercise program.

Nutritional status parameters
Body weight was measured, without shoes and wearing light clothes, on a digital balance scale (SECA 888, Hamburg, Germany). Height was measured or asked for, depending on the wellbeing of the patient. Nutritional status was evaluated by recall of patients’ usual body weight, weight change in the previous month and in the previous 6 months. BMI was calculated by body weight (kg) divided by the square of height (m²). Malnutrition was defined as > 5% weight loss in the previous month, or > 10% weight loss in the previous 6 months, or BMI < 18.5 kg/m² (< 65y) or BMI < 20 kg/m² (≥ 65y). REE (kcal/d) was estimated by Harris and Benedict (HB) equation, and a 30% increase for physical activity was added to REE to estimate TEE (kcal/d). A 24-hour recall was carried out to assess energy (kcal/d) and protein intake (g/d); consecutively, energy intake as % of TEE and protein intake per kg body weight were calculated. Dietary energy and protein intake were calculated using nutrition analysis software application (Voeding gui) with the use of the Dutch Food Composition table (NEVO 2006) (32).
**Fat free mass-index**

FFM was measured by bio-electrical impedance analysis (BIA) (BodyStat® Quadscan 4000, Bodystat Ltd.; Isle of Man, UK). Measurement was conducted with patients in a supine position, with four disposable electrodes of the BIA placed on the right hand and the right foot of patients (33). The variables from BIA used for this study were FFM, resistance, reactance, phase angle, illness marker, ICW and ECW. FFM was calculated from resistance and reactance at 50hz, by using the Kyle Geneva equation (34); FFMI was derived from FFM by dividing by the square of height (m) (FFM/height^2). FFMI was compared with age and gender specific reference values. The 5th percentile of age and gender specific reference values was used as a cut-off point for a reduced FFMI.

**Hand grip strength**

To determine the muscle strength of the upper extremities (34), hand grip strength (HGS) was measured at the non-dominant hand with a hydraulic hand dynamometer (Baseline). In a sitting position, the non-dominant elbow flexed at 90 degrees, forearm and wrist in neutral position, patients were asked to indent the dynamometer for 3 times, with a brief pause between the measurements.

The mean of three measurements was used to compare with age- and gender specific reference values (35). The 5th percentile was calculated from reference values of Bohannon, and used to identify patients with a reduced hand grip strength (36).

**Global health status and performance status**

Global health status, motivation and ability for exercise were determined by self-administered questionnaires. The EORTC QLQ-C30, a multidimensional validated cancer specific measure, was used to evaluate global health status and functional and symptom scales (36). Global health status implies the patients’ individual health status and quality of life. EORTC QLQ-C30 subscales scores varied from 0 to 100. A higher score for a functional or quality of life scale means a better level of functioning or quality of life. For symptom scales, a higher score indicates a higher presence of problems (37).

Performance status was defined by the WHO performance status scale (38). To analyse relations between performance status and other variables, performance status scores were classified into two groups (WHO performance status 0-2 and 3-4). According to the WHO performance status scale, a performance score 0 indicates a patient without any restrictions and a performance score of 4 indicates that the patient is completely bedbound.
Fatigue, motivation and ability for exercise

The fatigue symptom scale of the EORTC-QLQ-C30 questionnaire and the visual analogue scale (VAS) for fatigue were used to measure fatigue. If VAS for fatigue was > 5, it was regarded that patients experienced more fatigue than usual. To measure appetite, another VAS was used. A reduced appetite was regarded if VAS for appetite was < 5.

An exercise beliefs questionnaire, consisting of 8 questions, was used to investigate individual expectation on motivation and ability to follow a physical exercise program during chemotherapy. In addition, the ASE questionnaire, consisting of 28 questions, was used to investigate the Attitude, Social influence and self-Efficacy towards exercise. Both questionnaires are not validated.

Statistics

Patients’ characteristics were analysed by standard descriptive analyses; mean ± SD, median (range) and frequencies (%), as appropriate. Chi-square tests and independent t-tests were performed to compare categorical or continuous variables, to investigate differences between subgroups. The one sample t test was used to compare mean scores (EORTC-QLQ-C30) between the patients, general lung cancer population and general (healthy) population. Nutritional status parameters, FFMI and HGS were compared with general characteristic variables such as gender, age category, and stage of lung cancer. In addition, these variables were also compared with WHO performance status, global health status, motivation and ability for a physical exercise program. P-values < 0.05 were considered as statistically significant. All statistical analyses were performed using SPSS 15.0 (SPSS Inc., Chicago, IL, n USA).
Results

Twenty-seven patients were eligible, of which 6 patients refused to participate and 2 were not able to complete all assessments (see Figure 1). Nineteen patients were included, 14 men and 5 women, with a median age of 63 years (range 44 to 80). Seventeen participants had NSCLC (stage I to IV), one patient had SCLC and one had a thymoma. Three patients (16%) had a WHO performance score of 3 or 4.

Figure 1: Flowchart of enrolled lung cancer patients for chemotherapy

Participants were not significantly different from non-participants with regard to general characteristics (Table 1), but CRP was significantly higher in non-participants than in participants (P = 0.01). Hemoglobin tended to be lower in non-participants in comparison with the participants (P = 0.09). As shown, non-participants seem to have more inflammation than participants.
Table 1: General characteristics of patients with lung cancer, starting with chemotherapy

<table>
<thead>
<tr>
<th></th>
<th>Participants n = 19</th>
<th>Non-participants n = 8</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (Male (%))</td>
<td>74</td>
<td>63</td>
<td>0.56</td>
</tr>
<tr>
<td>Age (y)</td>
<td>64.1 ± 9.1</td>
<td>62.8 ± 8.0</td>
<td>0.73</td>
</tr>
<tr>
<td>Age category (%)</td>
<td></td>
<td></td>
<td>0.82</td>
</tr>
<tr>
<td>&lt;65y</td>
<td>58</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>≥65y</td>
<td>42</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Smoker (current: former) (%)</td>
<td>32 : 68</td>
<td>29 : 71</td>
<td>0.88</td>
</tr>
<tr>
<td>Diagnose, n (%)</td>
<td></td>
<td></td>
<td>0.66</td>
</tr>
<tr>
<td>NSCLC</td>
<td>17 (90)</td>
<td>7 (87)</td>
<td></td>
</tr>
<tr>
<td>Thymoma</td>
<td>1 (5)</td>
<td>1 (13)</td>
<td></td>
</tr>
<tr>
<td>SCLC</td>
<td>1 (5)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Stage, n (%)</td>
<td></td>
<td></td>
<td>0.81</td>
</tr>
<tr>
<td>Thymoma: No stage</td>
<td>1 (5)</td>
<td>1 (14)</td>
<td></td>
</tr>
<tr>
<td>NSCLC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-II</td>
<td>2 (10)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>IIIa</td>
<td>6 (32)</td>
<td>2 (29)</td>
<td></td>
</tr>
<tr>
<td>IIIb</td>
<td>3 (16)</td>
<td>1 (14)</td>
<td></td>
</tr>
<tr>
<td>IV (metastatic)</td>
<td>6 (32)</td>
<td>3 (43)</td>
<td></td>
</tr>
<tr>
<td>SCLC:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited</td>
<td>1 (5)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Extensive</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Treatment, n (%)</td>
<td></td>
<td></td>
<td>0.84</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>8 (42)</td>
<td>3 (43)</td>
<td></td>
</tr>
<tr>
<td>Chemoradiotherapy</td>
<td>9 (48)</td>
<td>3 (43)</td>
<td></td>
</tr>
<tr>
<td>Chemotherapy and surgery</td>
<td>1 (5)</td>
<td>1 (14)</td>
<td></td>
</tr>
<tr>
<td>Chemoradiotherapy and surgery</td>
<td>1 (5)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Biochemical parameters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hb</td>
<td>8.1 ± 0.9</td>
<td>7.4 ± 0.9</td>
<td>0.09</td>
</tr>
<tr>
<td>Albumin</td>
<td>36.0 ± 6.2</td>
<td>33.4 ± 6.3</td>
<td>0.37</td>
</tr>
<tr>
<td>CRP</td>
<td>11.0 ± 10.9</td>
<td>59.2 ± 63.2</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Data are represented as means ± SD, except when stated otherwise.

NSCLC: Non-Small Cell Lung Cancer; SCLC: Small Cell Lung Cancer; Hb: Hemoglobin; CRP: C-reactive Protein
Nutritional status parameters

Nutritional status parameters are displayed in Table 2. The mean weight loss in the previous month and previous 6 months were respectively 0.5 ± 3.2 and 1.1 ± 7.2 %. The mean BMI was 24.1 ± 3.6 kg/m² (range 17 – 30); 16% had underweight, 47% had normal weight and 37% had overweight. Malnutrition was found in 26% of the patients. Age category, gender, BMI classes, performance status or global health status were not significantly different in patients with malnutrition, compared to well-nourished patients.

The average resting energy expenditure (REE), estimated by the Harris & Benedict equation, was 1510 ± 193 kcal/d. After multiplying by 1.3 (for activity), TEE was estimated at 1963 ± 251 kcal/d. Energy intake was 1736 ± 539 kcal/d, 88.4 ± 24.3% of TEE. The average protein intake was 1.0 ± 0.4 g/kg/d (Table 2).

Table 2: Nutritional status parameters of the participants

<table>
<thead>
<tr>
<th></th>
<th>n =19</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMI (kg/m²)</strong></td>
<td>24.2 ± 3.6</td>
</tr>
<tr>
<td><strong>BMI class, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>3 (16)</td>
</tr>
<tr>
<td>Normal weight</td>
<td>9 (47)</td>
</tr>
<tr>
<td>Overweight</td>
<td>7 (37)</td>
</tr>
<tr>
<td><strong>Weight loss (%)</strong></td>
<td></td>
</tr>
<tr>
<td>In the previous month</td>
<td>0.5 ± 3.2</td>
</tr>
<tr>
<td>In the previous 6 months</td>
<td>1.1 ± 7.2</td>
</tr>
<tr>
<td><strong>Nutritional status, n (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Well-nourished</td>
<td>14 (74)</td>
</tr>
<tr>
<td>Malnourished</td>
<td>5 (26)</td>
</tr>
<tr>
<td><strong>Energy Expenditure</strong></td>
<td></td>
</tr>
<tr>
<td>REE (kcal/kg)</td>
<td>20.7 ± 1.7</td>
</tr>
<tr>
<td>TEE (kcal/kg)</td>
<td>27.0 ± 2.2</td>
</tr>
<tr>
<td><strong>Energy and protein intake</strong></td>
<td></td>
</tr>
<tr>
<td>Energy intake (kcal/kg)</td>
<td>24 ± 7.9</td>
</tr>
<tr>
<td>Energie intake (kcal/d)</td>
<td>1736 ± 539</td>
</tr>
<tr>
<td>Energy intake of TEE (%)</td>
<td>88.4 ± 26.3</td>
</tr>
<tr>
<td>Protein (g/kg/d)</td>
<td>1.0 ± 0.4</td>
</tr>
</tbody>
</table>

Data are represented as means ± SD, except when stated otherwise.
BMI: Body Mass Index; REE: Resting Energy Expenditure; TEE: Total Energy Expenditure
Fat free mass index
Outcomes with regard to FFMI and bio-electrical impedance analysis are displayed in Table 3. About 21% of the participants had a FFMI below the 5th percentile. These patients tended to have a higher illness marker than patients with a FFMI above the 5th percentile (P = 0.06). Malnourished patients more often had a FFMI below the 5th percentile (P = 0.01) than well-nourished patients. No other differences were observed, with regard to other variables.

Table 3: Outcome of bio-electrical impedance analysis of the participants

<table>
<thead>
<tr>
<th></th>
<th>n = 19</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFM (%)</td>
<td>71.5 ± 7.6</td>
<td>55.3 – 84.6</td>
</tr>
<tr>
<td>FFMI (kg/m²)</td>
<td>17.1 ± 2.0</td>
<td>13.6 – 20.7</td>
</tr>
<tr>
<td>ICW (L)</td>
<td>22.4 ± 4.4</td>
<td>14.1 – 31.2</td>
</tr>
<tr>
<td>ECW (L)</td>
<td>18.9 ± 1.9</td>
<td>13.5 – 23.0</td>
</tr>
<tr>
<td>Illness marker</td>
<td>0.85 ± 0.12</td>
<td>0.74 – 1.31</td>
</tr>
<tr>
<td>Phase angle (°)</td>
<td>5.3 ± 1.0</td>
<td>3.6 – 7.9</td>
</tr>
</tbody>
</table>

Data are represented as means ± SD, except when stated otherwise.

Hand grip strength
Hand grip strength was on average 113.7 ± 22.9% (range 80 to 177 %) of age- and gender specific reference values. About 16% of patients had a hand grip strength below the 5th percentile of the reference values. Malnourished patients and patients ≥ 65y had a higher hand grip strength (% of the reference values) than well-nourished patients (P = 0.04) or patients < 65y (P = 0.03). Patients with a WHO performance score of 3 or 4, tended to have a higher hand grip strength (P = 0.06).

EORTC QLQ-C30
Outcomes of EORTC QLQ-C30 variables are displayed in Table 4. All variables were compared with EORTC QLQ-C30 reference values of general healthy population and those of patients with all stages of lung cancer (39). The majority of the patients reported a significant lower global health status, physical functioning, role functioning, emotional functioning and social functioning than the general healthy population (Table 4). Symptoms such as fatigue, pain, dyspnoea and appetite loss were significantly more experienced in participants than in the general population. Most findings were comparable with reference values of the general lung cancer patients. Role functioning and constipation were significantly lower in the participants in this study than in general lung cancer patients. Also, participants tended to experience more pain when compared to the reference values of general lung cancer patients (Table 4).
### Table 4: Outcomes of EORTC QLQ-C30 variables, measured in the participants comparing with general lung cancer patients and the general healthy population (39)

<table>
<thead>
<tr>
<th></th>
<th>Participants, n = 19</th>
<th>Lung cancer: all stages, n = 3332</th>
<th>General healthy population, n = 7802</th>
<th>P-value</th>
<th>P-value *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global health status/quality of life</td>
<td>58.3 ± 19.8</td>
<td>56.6 ± 24.3</td>
<td>71.2 ± 22.4</td>
<td>0.708</td>
<td>0.011</td>
</tr>
<tr>
<td>Physical function</td>
<td>67.3 ± 25.6</td>
<td>71.9 ± 22.9</td>
<td>89.8 ± 16.2</td>
<td>0.443</td>
<td>0.001</td>
</tr>
<tr>
<td>Role functioning</td>
<td>42.1 ± 32.6</td>
<td>61.5 ± 33.9</td>
<td>84.7 ± 25.4</td>
<td>0.018</td>
<td>0.000</td>
</tr>
<tr>
<td>Emotional functioning</td>
<td>66.2 ± 18.5</td>
<td>68.4 ± 24.4</td>
<td>76.3 ± 22.8</td>
<td>0.537</td>
<td>0.029</td>
</tr>
<tr>
<td>Cognitive functioning</td>
<td>80.7 ± 18.6</td>
<td>82.3 ± 22</td>
<td>86.1 ± 20</td>
<td>0.713</td>
<td>0.223</td>
</tr>
<tr>
<td>Social functioning</td>
<td>69.3 ± 25.0</td>
<td>71.3 ± 29.4</td>
<td>87.5 ± 22.9</td>
<td>0.731</td>
<td>0.005</td>
</tr>
<tr>
<td>Fatigue</td>
<td>43.3 ± 18.1</td>
<td>41.1 ± 27.2</td>
<td>24.1 ± 24</td>
<td>0.607</td>
<td>0.000</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>6.1 ± 13.8</td>
<td>10.8 ± 19.7</td>
<td>3.7 ± 11.7</td>
<td>0.160</td>
<td>0.452</td>
</tr>
<tr>
<td>Pain</td>
<td>44.7 ± 31.5</td>
<td>29.7 ± 30.7</td>
<td>20.9 ± 27.6</td>
<td>0.052</td>
<td>0.004</td>
</tr>
<tr>
<td>Dyspnoea</td>
<td>40.4 ± 36.1</td>
<td>37.9 ± 32.2</td>
<td>11.8 ± 22.8</td>
<td>0.771</td>
<td>0.003</td>
</tr>
<tr>
<td>Insomnia</td>
<td>38.6 ± 37.3</td>
<td>31.6 ± 32.6</td>
<td>21.8 ± 29.7</td>
<td>0.424</td>
<td>0.065</td>
</tr>
<tr>
<td>Appetite loss</td>
<td>29.8 ± 33.1</td>
<td>28.1 ± 33.5</td>
<td>6.7 ± 18.3</td>
<td>0.823</td>
<td>0.007</td>
</tr>
<tr>
<td>Constipation</td>
<td>8.8 ± 18.7</td>
<td>19.2 ± 29.7</td>
<td>6.7 ± 18.4</td>
<td>0.026</td>
<td>0.636</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>7.0 ± 17.8</td>
<td>7.4 ± 17.9</td>
<td>7.0 ± 18</td>
<td>0.927</td>
<td>0.997</td>
</tr>
<tr>
<td>Financial difficulties</td>
<td>10.5 ± 27.3</td>
<td>17.4 ± 28.9</td>
<td>9.5 ± 23.3</td>
<td>0.287</td>
<td>0.872</td>
</tr>
</tbody>
</table>

* = Comparison between participants in this study and general healthy population.

### ASE questionnaire

The results from ASE questionnaire are shown in Table 5. In general, patients had a positive attitude about exercise. Social influences were not strong enough to influence motivation for exercise. Social influences from colleagues were not applicable for every patient, due to retirement. If patients had insufficient time, a bad mood or experienced muscle pain, self-efficacy for exercise was low. Bad weather, paying attention to others and having days off, did not influence patients’ self-efficacy for exercise. A small amount of patients did not answer these three questions, because they were not aware if they would be able to exercise in these circumstances (6-18%).
Table 5: Outcomes of the ASE questionnaire for attitude, social influences and self-efficacy, sorting in five answer categories.

<table>
<thead>
<tr>
<th>% of patients</th>
<th>Totally Agree</th>
<th>Kind of agree</th>
<th>Neutral</th>
<th>Kind of disagree</th>
<th>Totally disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Pleasure:</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I like to exercise</td>
<td>37</td>
<td>32</td>
<td>26</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Exercise is no fun</td>
<td>0</td>
<td>5</td>
<td>32</td>
<td>10</td>
<td>53</td>
</tr>
<tr>
<td>Exercise is annoying</td>
<td>0</td>
<td>11</td>
<td>21</td>
<td>26</td>
<td>42</td>
</tr>
<tr>
<td><em>Advantages/Disadvantages:</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise is relaxing for me</td>
<td>42</td>
<td>21</td>
<td>16</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Exercise keeps me fit</td>
<td>63</td>
<td>26</td>
<td>11</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Exercise keeps me healthy</td>
<td>63</td>
<td>32</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Exercise gives me energy</td>
<td>42</td>
<td>21</td>
<td>26</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Exercise regularly improves social contacts</td>
<td>37</td>
<td>26</td>
<td>32</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Exercise helps me to keep a healthy weight</td>
<td>42</td>
<td>26</td>
<td>11</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Exercise is not good for me</td>
<td>11</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>68</td>
</tr>
<tr>
<td>Exercise increase the risk on injuries</td>
<td>16</td>
<td>5</td>
<td>42</td>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td>Exercise is too exhausting for me</td>
<td>10</td>
<td>16</td>
<td>32</td>
<td>26</td>
<td>16</td>
</tr>
<tr>
<td>I dont have time to exercise</td>
<td>11</td>
<td>0</td>
<td>5</td>
<td>37</td>
<td>47</td>
</tr>
<tr>
<td>People should have minimum exercise</td>
<td>0</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>89</td>
</tr>
<tr>
<td><strong>Social influences</strong></td>
<td>Almost Everybody</td>
<td>More than half</td>
<td>Around half</td>
<td>Less than half</td>
<td>Almost nobody</td>
</tr>
<tr>
<td>My family members stimulates me to exercise</td>
<td>26</td>
<td>16</td>
<td>21</td>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td>My colleagues stimulates me to exercise</td>
<td>14</td>
<td>7</td>
<td>21</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>My friends stimulates me to exercise</td>
<td>10</td>
<td>16</td>
<td>32</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>My family members thinks exercise is important for me</td>
<td>21</td>
<td>32</td>
<td>5</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>My colleagues thinks exercise is important for me</td>
<td>7</td>
<td>27</td>
<td>13</td>
<td>7</td>
<td>46</td>
</tr>
<tr>
<td>My friends thinks exercise is important for me</td>
<td>11</td>
<td>26</td>
<td>21</td>
<td>5</td>
<td>37</td>
</tr>
<tr>
<td>My family members exercise regularly themselves</td>
<td>17</td>
<td>33</td>
<td>28</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>My colleagues exercise regularly themselves</td>
<td>0</td>
<td>29</td>
<td>21</td>
<td>14</td>
<td>36</td>
</tr>
<tr>
<td>My friends exercise regularly themselves</td>
<td>21</td>
<td>10</td>
<td>32</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td><strong>Self- efficacy</strong></td>
<td>Totally</td>
<td>Probably</td>
<td>No opinion</td>
<td>Probably not</td>
<td>Totally not</td>
</tr>
<tr>
<td><em>Are you able to exercise if:</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The weather is bad</td>
<td>35</td>
<td>35</td>
<td>6</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>You do not have enough time</td>
<td>29</td>
<td>23</td>
<td>12</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Other people are asking your attention</td>
<td>23</td>
<td>53</td>
<td>18</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>You have muscle pain</td>
<td>6</td>
<td>41</td>
<td>6</td>
<td>6</td>
<td>41</td>
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<tr>
<td>You are in a bad mood</td>
<td>24</td>
<td>35</td>
<td>0</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>You have vacation or days-off</td>
<td>41</td>
<td>29</td>
<td>0</td>
<td>6</td>
<td>23</td>
</tr>
</tbody>
</table>
Exercise beliefs, appetite and fatigue

From the Exercise beliefs questionnaire, motivation and ability for exercise was evaluated. The results showed that almost 37% of the patients were unsure if they were able to follow an exercise program, because of the probable impact of chemotherapy on their overall wellbeing. A remaining 37% thought to be able to follow an exercise program during chemotherapy and 26% answered to be not able.

With regard to motivation to follow an exercise program during chemotherapy, nearly 53% of the patients were motivated and 37% indicated that they were not motivated. The remaining 10% could not answer the question. Based on the VAS, 32% of the patients experienced fatigue and 53% of the patients experienced a decreased appetite at the start of chemotherapy. The average mean of the VAS for fatigue was 4.3 ± 2.6 cm and the VAS for appetite was 5.5 ± 2.9 cm.

Relations and differences

Patients who were motivated to follow a physical exercise program during chemotherapy, reported a better global health status (P < 0.01) and cognitive functioning (P = 0.02). Patients, who thought to be able to follow an exercise program during chemotherapy, reported a better global health status (P < 0.01), physical functioning (P < 0.01), role functioning (P < 0.01) and less fatigue (P = 0.03) than patients who expected to be not able to follow a physical exercise program. For other variables (e.g. nutritional status, gender, stage of lung cancer), no differences were observed between groups. Functional and symptom scales of the EORTC QLQ-C30 were also not different for the motivation or ability to follow a physical exercise program.

Patients with a WHO performance score of 0-2 had significantly a better physical functioning (P = 0.04), role functioning (P = 0.01), social functioning (P < 0.01), less financial difficulties (P < 0.01), fatigue (P = 0.04) and appetite loss (P = 0.03) compared to patients with a performance score of 3 or 4. Symptoms like pain (P < 0.01) and dyspnoea (P = 0.03) occurred significantly more in patients with a performance score of 0-2. It appeared that patients ≥ 65y more often had a WHO performance score of 3 or 4 (P = 0.03).

Malnourished lung cancer patients did not experience a lower quality of life, performance status or more symptoms than well-nourished patients. The motivation or ability to follow a physical exercise program did not differ between malnourished and well-nourished patients.

Patients who were motivated and able to follow a physical exercise program did not significantly differ with regard to other variables such as stage of lung cancer, age category (< and ≥ 65y) and BMI class.
Discussion

This pilot study obtained data on nutritional status, global health status, performance status, motivation and ability for physical exercise in lung cancer patients, at the start of chemotherapy. Findings suggest that malnutrition appears in approximately a quarter of the group and a majority had a WHO performance score of 0-2. More patients were motivated (53%) for an exercise program than patients who thought to be able to follow a physical exercise program (37%). The explanation for these results may be due to the unfamiliarity of patients with regard to the side effects of chemotherapy. Patients did not know if they would be able to follow an exercise program during chemotherapy, or expected not to be able. Studies investigating the feasibility of an exercise program during chemotherapy in patients with lung cancer, are still lacking and require more investigation. Only one study showed a participation rate of eighty percent at baseline, of which about half completed the exercise program (24).

The expectations before the start of this pilot study were that patients with a better global health status or performance status would be more motivated and able to follow a physical exercise program. As expected, patients with a better global health status were more motivated and able for an exercise program; no difference could be found for performance status.

Other hypotheses were that malnourished patients would have a lower FFMI, hand grip strength, global health status and poorer performance status. As expected, malnourished patients did have a significantly lower FFMI. Remarkably, malnourished patients had a significantly better hand grip strength than well-nourished patients, which is in contrary of our expectation before the start of this study and other studies. Probably this result can be ascribed to the small size of the study group and a high amount of well-nourished patients. Other studies showed a lower hand grip strength in malnourished patients as compared to well-nourished patients (40;41).

In contrary with the expectation, malnourished patients did not experience a lower global health and performance status; these may be due to the small sample size of this study. Participants in this study experienced significantly more symptoms such as fatigue, pain, and dyspnoea and appetite loss than the general healthy population. Also other studies showed that these symptoms are common known in lung cancer patients (42;43). Most of the functional and symptoms scales of the participants were similar to the reference values of the general lung cancer patients. Remarkably is that the role functioning scale is significantly lower than the general lung cancer patients. In other terms, patients in this study were more limited in pursuing their work and other daily activities. This may be explained by the performance status
of the participants. If patients had a performance score of 0-2, they had significantly a better role functioning, than the patients with a performance score of 3 or 4. However, data on the performance status of the general lung cancer patients, could not be found (39). To our knowledge, there are no studies examining all variables (nutritional status, physical condition, motivation and ability for exercise) in lung cancer patients, at the start of chemotherapy. The results provide an indication of the amount of patients who are motivated and able to exercise during chemotherapy. So the results of this study might be useful for studies investigating the feasibility of a physical exercise program during chemotherapy. To ensure the reliability of this study, validated self-administered questionnaires (EORTC QLQ-C30 and VAS) and measurement equipments (Quadscan and hand grip dynamometer) were used. For each measurement the same equipment was used, and standardized procedures were followed. The exercise beliefs questionnaire was used to evaluate the expectation of motivation and ability for a physical exercise program during chemotherapy. Although this questionnaire is not validated, it asks directly if the patient is motivated and able to follow a physical exercise program. The ASE questionnaire is also a non-validated questionnaire, which measures the attitude, social influences and self-efficacy towards physical exercise. However, this questionnaire clearly reflects the patients’ attitude for exercise. It can be used to determine personal attitudes influence on the motivation for exercise.

A limitation in this study was the small size. This has resulted in a low power, and low chance of finding statistically significant differences between variables. Nevertheless, this study provides useful data about the motivation and ability of lung cancer patients to follow an exercise program.

An advice for the specialists in the VU Medical Center, for the introduction of a physical exercise program during chemotherapy, is to inform the patients prior to their treatment. Based on our findings, it is vital to introduce such an exercise program during an intake with a specialist (e.g. the oncologist, nurse practitioner or physiotherapist). When the benefits of physical exercise during chemotherapy are explained and the training is introduced as part of their treatment, the participation rate and benefits for patients will probably be higher.
Conclusion

In conclusion, a majority of the patients is motivated to follow a physical exercise program, but less patients claim to be able to follow a physical exercise program. Also, it appears that lung cancer patients experience a reduced global health status, before the start of their treatment. They have common symptoms, specific for lung cancer patients, such as fatigue, pain and dyspnoea. Further studies are needed, to clarify these findings and to describe the feasibility of a physical exercise program during chemotherapy. This study shows that patients, who are hardly or not restricted in their daily activities and adequately motivated, are probably motivated and able to follow a physical exercise program during chemotherapy.
References


(27) Isenring EA, Capra S, Bauer JD. Nutrition intervention is beneficial in oncology outpatients receiving radiotherapy to the gastrointestinal or head and neck area. Br J Cancer 2004 August 2;91(3):447-52.


**Attachment I: EORTC QLQ-C30**

**EORTC QLQ-C30 (version 3)**

Wij zijn geïnteresseerd in bepaalde dingen over u en uw gezondheid. Wilt u alle vragen zelf beantwoorden door het getal te omcirkelen dat het meest op u van toepassing is. Er zijn geen "juiste" of "onjuiste" antwoorden. De informatie die u geeft zal strikt vertrouwelijk worden behandeld.

Wilt u uw voorletters invullen:  
Uw geboortedatum (Dag, Maand, Jaar):  
De datum van vandaag (Dag, Maand, Jaar): [31]

<table>
<thead>
<tr>
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<th>Nogal</th>
<th>Heel erg</th>
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**Gedurende de afgelopen week:**

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<th>Heel erg</th>
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<td>4</td>
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Wilt u a.u.b. naar de volgende bladzijde gaan.
**Gedurende de afgelopen week:**

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<tbody>
<tr>
<td>15.</td>
<td>Heeft u overgegeven?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>16.</td>
<td>Had u last van obstipatie? (was u verstopt?)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>17.</td>
<td>Had u diarree?</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>18.</td>
<td>Was u moe?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>19.</td>
<td>Heeft pijn u gehinderd in uw dagelijkse bezigheden?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Heeft u moeite gehad met het concentreren op dingen, zoals een krant lezen of televisie kijken?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Voelde u zich gespannen?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Maakte u zich zorgen?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Voelde u zich prikelbaar?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>Voelde u zich neerslachtig?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Heeft u moeite gehad met het herinneren van dingen?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Heeft uw lichamelijke toestand of medische behandeling uw familieleven in de weg gestaan?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Heeft uw lichamelijke toestand of medische behandeling u belemmerd in uw sociale bezigheden?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>Heeft uw lichamelijke toestand of medische behandeling financiële moeilijkheden met zich meegebracht?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

**Wilt u voor de volgende vragen het getal tussen 1 en 7 omcirkelen dat het meest op u van toepassing is**

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<table>
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<tbody>
<tr>
<td>29.</td>
<td>Hoe zou u uw algehele gezondheid gedurende de afgelopen week beoordelen?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Erg slecht</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hoe zou u uw algehele &quot;kwaliteit van het leven&quot; gedurende de afgelopen week beoordelen?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Erg slecht</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Attachment II: ASE questionnaire

Vragenlijst ASE

Toelichting

- De volgende stellingen gaan over uw mening over bewegen. Geef aan in hoeverre u het met de beweringen eens of oneens bent. Kruis aan wat het meest op u van toepassing is.
- Tijd om in te vullen: 3 minuten.

Vragen A

<table>
<thead>
<tr>
<th>Nummer</th>
<th>Stelling</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ik vind bewegen leuk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Ik kan mij ontspannen door te bewegen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Bewegen is niet goed voor mij</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Door te bewegen blijf ik gezond</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Door te bewegen krijg ik meer energie</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Bewegen verhoogt de kans op ongelukken en blessures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Regelmatic bewegen is goed voor mijn sociale contacten</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Ik vind bewegen vervelend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Ik heb niet genoeg tijd om te bewegen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Door te bewegen houd ik een goed gewicht</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Bewegen is voor mij te vermoeiend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Een mens moet zo weinig mogelijk bewegen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Door te bewegen blijf ik in conditie</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Ik vind sporten niet leuk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Toelichting

- De volgende vragen gaan over hoe mensen in uw omgeving denken over bewegen. Kruis aan wat het meest op u van toepassing is.
- Tijd om in te vullen: 3 minuten

**Vragen S**

<table>
<thead>
<tr>
<th></th>
<th>(Bijna) iedereen</th>
<th>Meer dan de helft</th>
<th>Ongeveer de helft</th>
<th>Minder dan de helft</th>
<th>(Bijna) niemand</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Door hoeveel van uw directe familieleden wordt u gestimuleerd om regelmatig te bewegen?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Door hoeveel van uw collega's wordt u gestimuleerd om regelmatig te bewegen?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Door hoeveel van uw vrienden wordt u gestimuleerd om regelmatig te bewegen?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Hoeveel directe familieleden vinden het belangrijk dat u regelmatig beweegt?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Hoeveel collega's vinden het belangrijk dat u regelmatig beweegt?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Hoeveel vrienden vinden het belangrijk dat u regelmatig beweegt?</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. Hoeveel van uw directe familieleden bewegen zelf regelmatig?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Hoeveel van uw collega's bewegen zelf regelmatig?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Hoeveel van uw vrienden bewegen zelf regelmatig?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Toelichting

- Stel: de volgende situatie doet zich voor, lukt het u dan om te gaan bewegen? Kruis aan wat het meest op u van toepassing is.
- Tijd om in te vullen: 2 minuten.

Vragen E

<table>
<thead>
<tr>
<th></th>
<th>Zeker wel</th>
<th>Waarschijnlijk wel</th>
<th>Weelk niet</th>
<th>Waarschijnlijk niet</th>
<th>Zeker niet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>2.</td>
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<tr>
<td>3.</td>
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<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Het weer is erg slecht
2. U heeft weinig tijd
3. Anderen mensen vragen uw aandacht
4. U heeft spierpijn
5. U heeft een slecht humeur
6. U heeft vakantie of vrije dagen
Attachment III: Exercise Beliefs

Verwachtingen ten aanzien van training tijdens chemotherapie

Geef antwoord op de onderstaande vragen. U kunt antwoorden met ja of nee. Wilt u proberen om alle vragen te beantwoorden.

JA  NEE

1. Denkt u dat u zelf iets kan doen om negatieve gevolgen van de chemotherapie te beperken? .... ....

2. Denkt u dat uw eigen inzet kan bepalen of het beter of slechter met u gaat tijdens de chemotherapie periode? .... ....

In de onderstaande vragen wordt met een trainingsprogramma bedoeld: 2x in de week 1 uur trainen onder begeleiding van een fysiotherapeut bij u in de woonomgeving. De training is gericht op conditie en kracht.

3. Denkt u dat het volgen van een trainingsprogramma negatieve gevolgen van de chemotherapie kan beperken? .... ....

4. Denkt u dat het volgen van een trainingsprogramma u helpt om uw conditie en kracht te behouden tijdens chemotherapie? .... ....

5. Denkt u dat het volgen van een trainingsprogramma te zwaar zal zijn naast uw chemotherapie? .... ....

6. Ziet u het nut in van het volgen van een trainingsprogramma gedurende uw chemotherapie? .... ....

7. Bent u gemotiveerd om deel te nemen aan een trainingsprogramma gedurende uw chemotherapie? .... ....

8. Verwacht u dat u in staat bent om een trainingsprogramma te volgen gedurende uw chemotherapie? .... ....
Attachment IV: VAS for appetite and fatigue

VAS eetlust en vermoeidheid

Met behulp van een lijntje van 10 centimeter willen wij graag weten hoe u uw eetlust en vermoeidheid over de afgelopen week beoordeelt. Zou u een verticaal streepje op de lijn willen zetten? Dat ziet er als volgt uit:

Voorbeeld:
Hoe beoordeelt u uw eetlust over de afgelopen week?

![Eetlust Lijntje](image)

**Mijn eetlust was heel erg goed**

**Ik had helemaal geen eetlust**

---

VAS eetlust

Hoe beoordeelt u uw eetlust over de afgelopen week?

![Eetlust Lijntje](image)

**Mijn eetlust was heel erg goed**

**Ik had helemaal geen eetlust**

---

VAS vermoeidheid

Hoe beoordeelt u uw vermoeidheid over de afgelopen week?

![Vermoeidheid Lijntje](image)

**Ik was heel erg moe**

**Ik was helemaal niet moe**
Attachment V: Clinical Research Form

Clinical Research Form (CRF)  Datum: ___/___/_____

Patiëntennummer: ____________
Researchnummer: ______________________

**Demografische gegevens**

Geslacht  
- [ ] man  
- [ ] vrouw

Geboortedatum  
___/___/_____

Diagnose
- [ ] NSCLC  
- [ ] SCLC  
- [ ] Anders, namelijk ______________________

Stadium:  
- [ ] I  
- [ ] II  
- [ ] IIIa  
- [ ] IIIb IV  
- [ ] T_  
- [ ] N_  
- [ ] M_

Beoogde behandeling:  
- [ ] Chemotherapie  
- [ ] Radiotherapie  
- [ ] Immuuntherapie  
(meerdere opties mogelijk)  
- [ ] Chemoradiatie  
- [ ] Operatie

Opmerkingen:  
________________________________________

Is de patiënt een roker?  
- [ ] Ja  
- [ ] Nee

Zo ja, hoeveel?  
________

Heeft de patiënt een pacemaker?  
- [ ] Ja  
- [ ] Nee

Opmerkingen:  
________________________________________

Is er sprake van ascites en/of oedeem?  
- [ ] Ja, enkeloedeem  
- [ ] Ja, ascites  
- [ ] Nee

**Metingen**

Lengte (bij voorkeur zelf meten)  
___, ___ m

Gewicht (zonder schoenen en met lichte kleding)  
___, ___ kg

Normaal gewicht (stabil gewicht vóór ziekte)  
___ kg

Gewichtsverandering in afgelopen maand  
___ kg  
- [ ] ↑  
- [ ] ↓

Gewichtsverandering in afgelopen 6 maanden  
___ kg  
- [ ] ↑  
- [ ] ↓

BMI  
___

Opmerkingen:  
________________________________________

<table>
<thead>
<tr>
<th>BIS4200</th>
<th>Code:</th>
<th>BODYSSTAT</th>
<th>Code:</th>
<th>QUADSCAN</th>
<th>Code:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vetvrij</td>
<td>massa</td>
<td>___ kg</td>
<td>Vetvrij</td>
<td>massa</td>
<td>___ kg</td>
</tr>
<tr>
<td>RES 50 khz</td>
<td>___ Ω</td>
<td>RES 50 khz</td>
<td>___ Ω</td>
<td>RES 50 khz</td>
<td>___ Ω</td>
</tr>
<tr>
<td>REAC</td>
<td>___ Ω</td>
<td>REAC</td>
<td>___ Ω</td>
<td>REAC</td>
<td>___ Ω</td>
</tr>
<tr>
<td>PHASE</td>
<td>___ º</td>
<td>PHASE</td>
<td>___ º</td>
<td>PHASE</td>
<td>___ º</td>
</tr>
<tr>
<td>RES Fc</td>
<td>___ Ω</td>
<td>FFMI</td>
<td>___</td>
<td>ECW</td>
<td>___ % / lt</td>
</tr>
<tr>
<td>REAC</td>
<td>___ Ω</td>
<td>ICW % / lt</td>
<td>___ % / ___ lt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHASE</td>
<td>___ º</td>
<td>Illness marker</td>
<td>___</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fc</td>
<td>___</td>
<td>FFMI</td>
<td>___</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dominante hand  
(niet-dominant)  
rechts / links  
___ kg  
___ kg  
___ kg
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Eenheid</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumine</td>
<td>g/l</td>
<td></td>
</tr>
<tr>
<td>Hb</td>
<td>mmol/l</td>
<td></td>
</tr>
<tr>
<td>CRP</td>
<td>mg/l</td>
<td></td>
</tr>
</tbody>
</table>

**WHO Performance Score**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic (Fully active, able to carry on all predisease activities without restriction)</td>
<td>0</td>
</tr>
<tr>
<td>Symptomatic but completely ambulatory (Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature. For example, light housework, office work)</td>
<td>1</td>
</tr>
<tr>
<td>Symptomatic, &lt;50% in bed during the day (Ambulatory and capable of all self care but unable to carry out any work activities. Up and about more than 50% of waking hours)</td>
<td>2</td>
</tr>
<tr>
<td>Symptomatic, &gt;50% in bed, but not bedbound (Capable of only limited self-care, confined to bed or chair 50% or more of waking hours)</td>
<td>3</td>
</tr>
<tr>
<td>Bedbound (Completely disabled. Cannot carry on any self-care. Totally confined to bed or chair)</td>
<td>4</td>
</tr>
</tbody>
</table>
24-h recall

Gebruikt u voedingssupplementen (vitaminesuppletie, drinkvoeding, sondevoeding en poeders)?

☐ Ja  ☐ Nee

Zo ja, welke? 

Evaart u problemen met eten?

Zo ja, welke? 

Wat heeft de patiënt gisteren gegeten en gedronken?

<table>
<thead>
<tr>
<th>Moment</th>
<th>Product</th>
<th>Toelichting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontbijt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tussendoor 's morgens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middageten</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tussendoor 's middags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avondeten</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tussendoor 's avonds</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>