

Original Article

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Geographical distance as an impeding factor for cancer patients' participation in a specialised exercise programme

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ABSTRACT

INTRODUCTION: Specialised exercise has proven beneficial for cancer patients who are therefore offered a supervised six-week exercise programme at hospitals in Denmark. This quality assurance study investigated whether the distance between home and hospital and other demographic variabilities affected patients' participation in and completion of the programme.

METHODS: Data were collected on cancer patients' participation in a specialised exercise programme at the Department of Oncology, Vejle Hospital, Denmark, between January 2014 and June 2017. Data covering the same period were collected on all patients referred to the department. Demographics and information on cancer diagnosis were retrieved from the patient administrative systems. The distance by car from patients' residential postcode to hospital was measured using a map service. The potential relationship between distance to hospital and participation was investigated by univariate and multivariate regression analyses.

RESULTS: Travel distance had a significant impact ($p < 0.001$) on participation. Similarly, gender ($p = 0.001$), intention of treatment ($p = 0.001$) and type of cancer ($p = 0.001$) were of significance to completion of the programme.

CONCLUSIONS: Travel distance tended to compromise participation, but for patients who chose to participate, travel distance did not affect completion of the programme.

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Cancer is a serious disease associated with high morbidity and mortality. Patients often suffer from several symptoms, e.g. pain and cancer-related fatigue (CRF) [1], and various interventions have been suggested including psychostimulants, psychoeducation and physical exercise, among which supervised physical exercise in particular has proven to reduce CRF [1-3].

A Danish randomised controlled trial tested an intervention with a six-week physical exercise programme and found that the intervention group achieved a significant reduction in self-reported CRF. They concluded that the intervention could safely be completed by cancer patients, including those with

advanced disease. The exercise intervention improved fitness and muscle strength, physical and functional activity, and emotional well-being of cancer patients receiving chemotherapy [4, 5].

Based on reduction in CRF, improved daily function and emotional well-being, cancer patients in Denmark are offered a supervised six-week physical exercise programme in the hospital setting. Many Danish municipalities also offer rehabilitation exercise for cancer patients, but their programme is less intense. Cancer patients have many appointments at the hospital during their treatment trajectory. A review investigated whether travel distance between home and hospital was a barrier to timely cancer diagnosis and treatment [6]. The review included 27 studies, the majority of which were performed in the US and Australia. Distance tended to be associated with more advanced cancer stage at the time of diagnosis, poorer prognosis and poorer quality of life. Travel distance made some patients opt out of the most proper treatment to reduce the number of appointments. A distance exceeding 80 km seemed to affect adherence.

The aim of this quality assurance study was to investigate the impact of travel distance on the participation in and completion of a specialised physical exercise programme.

METHODS

Study design

In Denmark, quality assurance studies require no approval by a Research Ethics Committee. This study was approved by the executive management of Vejle Hospital, Denmark, and complied with relevant data safety regulations.

Patients

Patients within the hospital referral area were eligible for the study if they had received a minimum of one treatment (chemotherapy or immunotherapy) at the Department of Oncology and otherwise met the eligibility criteria (**Appendix 1**). https://ugeskriftet.dk/files/a01200044_-_supplementary_.pdf

Exercise programme

The exercise programme consisted of supervised training four days a week for six weeks. The participants' physical fitness was established before and after the six-week programme by means of a submaximal cycle ergometer exercise test for assessment of maximal oxygen uptake. The exercise programme, including fitness, stress relief and massage, was tailored to the individual patient's capacity. Each training group consisted of 12 participants of different age, gender and cancer diagnosis. The training was supervised by a physiotherapist and an oncology nurse [7, 8].

Data

Data were collected partly from an in-house questionnaire designed specifically for the exercise programme and partly from the hospital's patient administrative system. Participants completed the questionnaire before and after the intervention.

Data were collected between January 2014 and June 2017 on age, gender, marital status, educational degree, postcode and completion or not of the intervention. A completed questionnaire and/or ergometer exercise test both before and after the programme was defined as completion. Any missing data were retrieved from the patient's electronic medical record together with information on cancer diagnosis and

treatment. Physical fitness before and after the intervention builds on data entered into a database by the physiotherapists.

A control group was established by collecting information on gender, age, postcode and cancer diagnosis from all patients referred to the Department of Oncology, Vejle Hospital, between January 2014 and June 2017.

Travel distance calculation

The travel distance to the hospital was based on residential postcodes and calculated using Google Maps [9] and the suggested route by car. Since a postcode was not available for all patients in the control group, the residential county was used for sensitivity analysis.

Statistical analysis

Differences in demographic and distance variables between the intervention and control groups and the completing and non-completing patients, respectively, were calculated by chi-squared statistics. A p-value < 0.05 was considered statistically significant. The univariate analysis was supplemented by multivariate logistic regression analysis. Given that distance was the main parameter in this study, it was always included in the multivariate analysis along with gender and age. In the model building, other variables with $p < 0.10$ in univariate analysis were included, too.

Trial registration: not relevant.

RESULTS

A total of 287 patients participated in the specialised exercise programme from January 2014 to June 2017. Since the study only included patients treated at the Department of Oncology, Vejle Hospital, 15 were excluded leaving 272 participants for analysis. The group consisted mostly of women, the majority of whom had breast cancer. A total of 39 patients did not complete the six-week intervention. Patient characteristics are shown in **Table 1**.

From January 2014 to June 2017, a total of 1,893 patients from the hospital district were referred to the Department of Oncology. Among these, 220 patients participated in the exercise programme (52 were from other hospital districts), leaving a control group of 1,673 patients. Characteristics of the control and intervention groups are shown in **Table 2**.

TABLE 1 / Participant characteristics.

	Completion (N = 233)	Non- completion (N = 39)	p-value ^a
<i>Gender, n</i>			< 0.001
Women	196	22	
Men	37	17	
Age, median (range), yrs	55 (28-80)	56 (28-75)	0.887
<i>Type of cancer, n</i>			0.001
Breast cancer	139	15	
Lung	28	10	
Gastrointestinal	45	10	
Gynaecological	20	2	
Urological	2	2	
<i>Intention of treatment, n</i>			0.001
Neoadjuvant	67	11	
Adjuvant	119	12	
Palliative	47	16	
<i>Marital status, n</i>			0.570
Married/cohabitant	191	28	
Divorced/single/widow(er)	37	7	
Unknown	5	4	
<i>Level of education, n</i>			0.189
Primary school	11	5	
Secondary school	15	2	
Further education: 1-3 yrs	58	6	
Further education: 3-4 yrs	84	8	
Further education: ≥ 5 yrs	21	4	
Vocational education	38	6	
Unknown	6	8	
Distance, residential postcode, median (range), km	21 (3-99)	19 (3-56)	0.372
Fitness rating: V _O ₂ max, median start-up (range), l/min.	29.6 (10.6-58.8)	27.4 (19.8-34.8)	

V_O₂max = maximal oxygen uptake.

a) Univariate analysis.

TABLE 2 / Characteristics of patients referred from the hospital district.

	Control group (N = 1,673)	Intervention group (N = 220)	p-value ^a
<i>Gender, n</i>			< 0.001
Women	993	184	
Men	680	36	
Age, median (range), yrs	65 (23-92)	55 (28-82)	< 0.001
<i>Type of cancer, n</i>			< 0.001
Breast	414	129	
Lung	490	26	
Gastrointestinal	529	45	
Gynaecological	120	18	
Urological	120	2	
<i>Metastasis, n</i>			< 0.001
Yes	934	66	
No	739	154	
Travel distance, median (range), km	27 (3-37)	3 (3-37)	< 0.001

a) Univariate analysis.

Completion of the exercise programme

The two groups were, to some extent, quite similar (Table 1). The median travel distance was 21 km (range: 3-99 km) and 19 km (range: 3-56 km) for the completing and non-completing group, respectively, ($p = 0.37$). The percentage of men was higher in the non-completing than in the completing group, 44% and 16%, respectively, ($p < 0.001$). Type of cancer and intention of treatment were also significant in relation to

completion ($p < 0.001$). Patients with gastrointestinal cancer and those in palliative care had the lowest completion rate. Marital status, age and education had no significant impact on completion ($p = 0.57$, $p = 0.887$, $p = 0.19$, respectively), nor did fitness rating at start-up ($p = 0.65$). A multivariate regression analysis on gender, age and type of cancer showed that gender remained highly significant ($p < 0.001$), whereas type of cancer and distance were no longer significantly related to completion ($p = 0.06$ and $p = 0.15$). In the multivariate analysis, age was a significant factor ($p = 0.043$).

Participation in the exercise programme

Travel distance had a significant influence on participation ($p < 0.001$). Due to missing information on the residential postcode of 954 of the 1,893 patients, a univariate analysis of the travel distance based on residential county was performed yielding the same result ($p < 0.001$). As to referral to the exercise programme, gender, age, type of cancer and metastatic disease were of equally high significance ($p < 0.001$). A multivariate regression analysis including all variables (gender, age, type of cancer, metastasis and travel distance) confirmed that travel distance ($p < 0.001$) and age ($p < 0.001$) were highly significant and that gender ($p = 0.02$) and type of cancer ($p = 0.037$) were of some significance.

DISCUSSION

The aim of this study was to evaluate travel distance as a factor with potential influence on whether or not cancer patients would participate in and complete a specialised physical exercise programme. According to Birk et al, the most important contributor to outpatients' choice of clinic was the distance from home [10]. Although the study did not involve cancer patients, it supports the thesis of travel distance as an important factor for participation. The 85.7% completion rate in our study was high, but only 11% of the outpatients from the hospital district were enrolled in the exercise programme. As specialised exercise is considered beneficial, it is justified to seek explanations for the low participation rate. The distribution of patients either declining or being ineligible for referral to the training programme remains unknown.

In a randomised study by Andersen et al [5], 1,956 patients were referred for chemotherapy over a three-year period of whom 953 were potentially eligible for the training intervention. Among these, 447 patients declined due to lack of interest, travel distance, business and other reasons. Out of the remaining 506 patients, 237 did not meet the eligibility criteria, which resulted in a study population of 269 participants. Together with our data, this indicates that many patients decline or are not eligible for participation.

In general, Denmark has good infrastructure and therefore it is rather easy to reach the hospital by car [11]. Although travel by car was the measure used, we did not know the patients' actual travel routes. Some patients may have used public transportation, which is limited in some peripheral regions and may be impeding participation. Moreover, the number of visits to the clinic depends on the treatment regimen, and some patients' reserve of energy may not suffice to participate in the exercise programme. This may also apply to the relatives of patients requiring accompanied transportation.

In the non-completion group, the majority received palliative treatment, whereas in the completion group most patients received adjuvant treatment. Disease progression is more likely in patients in the palliative setting than in those receiving adjuvant treatment [1], which may explain the difference in completion between the groups.

Women seemed more likely than men to participate in and complete the programme. The number of

women clearly outweighed that of men in the intervention group (218 versus 54) and, hence, also in most of the exercise groups, which may have influenced the men's continued participation. It would potentially have increased the number of participating men if some of the groups had been for men only, as also indicated by a randomised intervention study concluding that mixed gender groups was not suitable for all patients [4].

The number of patients with breast cancer was much higher in the intervention group (59%) than in the control group (25%), which limits the study's projection to other cancer diseases. It was interesting to learn that the fitness rating upon training programme entry was not significant for completion. Thus, it was not given that a good fitness rating was equivalent to completion and a poor rating equivalent to dropout.

A study by Banck-Petersen et al involving a physical activity intervention in a setting comparable to ours found that age and employment status were associated with participation [12]; and in a randomised phase-II exercise trial [13], age was associated with randomisation onto the study protocol. As a supplement to these more stringent clinical trials, our real-world data identified distance as an important factor for participation. To make a more valid evaluation of factors contributing to participation and of the potential influence of geographical distance, a much higher number of participants is required together with information as to why some patients declined the offer.

This study is limited by the small sample sizes, especially of the non-completing group. Furthermore, the median distance travelled by the patients was relatively short. In a review on the influence of travel distance on timely diagnosis and treatment of cancer, a travel distance exceeding 80 km was a barrier [6]. The review mainly included studies performed in the US and Australia, both of which are geographically much larger than Denmark. The conception of travel may therefore differ greatly, i.e., distances considered short in the USA may be perceived as long in Denmark. Hence, the review results cannot be applied directly in Denmark, where distances shorter than 80 km may be of importance.

Travel distance may have had an impact on patients' acceptance or not of referral to the training programme, but once a patient decided to participate, the travel distance was of secondary importance to completion.

CONCLUSIONS

Long travel distance seemed to affect cancer patients' participation in a supervised six-week training programme. Other factors of importance for not participating were male gender, high age, other malignancy than breast cancer and metastatic disease. These identifiable factors may reduce equal access to the best offer. However, completion of the exercise programme seemed more dependent on gender and aim of oncology treatment than on travel distance. In the design of future specialised physical exercise programmes, these findings should be taken into consideration.

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