

ORIGINAL ARTICLE

Social position and referral to rehabilitation among cancer patients

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ABSTRACT

Objectives. In Denmark, most healthcare services, including cancer treatment and rehabilitation, are offered free of charge by referral from a treating physician; thus, social equality should be expected. In a population-based cohort study of registry-based data, we examined the association between socioeconomic position, measured as educational level, and referral to rehabilitation services among cancer patients.

Material and methods. Through the Danish Cancer Registry, we identified all people resident in the Municipality of Copenhagen with cancer diagnosed in 2007–2012. Information on all rehabilitation referrals was retrieved from the Municipal Centre for Cancer Rehabilitation for 2009–2012. Information on demographic and socioeconomic characteristics was obtained from national Danish registers. The Cox proportional hazards model was used to investigate associations between educational level and referral to rehabilitation with adjustment for sex, age, diagnosis, disposable income, cohabitation status and number of children living at home at the time of diagnosis.

Results. A primary cancer was diagnosed in 13 840 people, of whom 2148 (16%) were referred to rehabilitation services during follow-up. In the fully adjusted model, we found education to be a predictor of referral, with a hazard ratio of 1.33 (95% CI 1.19–1.49) for patients with long education and a hazard ratio of 1.15 (95% CI 1.03–1.29) for patients with medium education as compared with patients with short education.

Conclusions. Our findings suggest that, even after differences in demographics and cancer characteristics are accounted for, referral to rehabilitation services is not equally distributed by social group. Higher educational level is associated with a higher probability of referral to rehabilitation services.

In Denmark, cancer is diagnosed in 35 000 people every year, and an estimated 30–70% will need rehabilitative services at some time [1–3]. The Danish healthcare system is characterised by equal access to health care services for all Danish citizens. Nevertheless, social inequality in several cancer outcomes has been documented, favouring more socially advantaged patients [4]. Patients with a low socioeconomic position, measured as length of education or income, are more likely to have cancer at a more advanced stage at diagnosis and, for some patient groups, to receive less appropriate treatment [5–11]. Further, comorbidity and an unhealthy lifestyle are more prevalent among cancer patients with a low

socioeconomic position [5,6]. Such socioeconomic differences in stage, treatment and comorbidity are likely to result in social differences in the need for and access to rehabilitation.

Rehabilitation can be defined as a process of cooperation between the patient, relatives and health professionals. Its aim is to prevent limitations to physical, psychological and social functioning and wellbeing and to establish the basis for an independent, meaningful life [12]. Cancer rehabilitation has been officially part of the national Danish cancer programme only since 2007. Little research has been conducted on the implementation of rehabilitation programmes in Denmark or internationally [9], and

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only a few studies have addressed social inequality in need for and use of cancer rehabilitation. Most studies showed that cancer patients participating in rehabilitation were more likely to be well educated and socioeconomically advantaged than the overall population of cancer patients [2,10,13–16] and that cancer patients with short education and low income participated less frequently in rehabilitation activities and had more unmet needs [16]. Most of our understanding of socioeconomic factors and cancer rehabilitation stems from studies in which potential selection bias in participation according to socioeconomic factors cannot be excluded. To our knowledge, objective measures have not been used previously to examine social inequality in current cancer rehabilitation programmes.

The aim of this population-based cohort study of patients with cancer diagnosed in Copenhagen during 2007–2012 was to investigate the relation between socioeconomic position, as measured by highest attained education level, and the probability of referral to rehabilitation. We hypothesised that a higher educational level was associated with a higher probability of referral, as educational attainment could affect a patient's ability to communicate a need for rehabilitation or be aware of the existence of such healthcare services. Further, we explored whether

other socioeconomic factors, such as disposable income, cohabitation status and having children living at home at the time of diagnosis, mediated the effect of education on the rate of referral for rehabilitation.

Material and methods

Study setting

We conducted a population-based cohort study covering Copenhagen Municipality, which has about 550 000 inhabitants (10% of the Danish population). The Municipality organises cancer rehabilitation at one centre, the Centre for Cancer and Health, where rehabilitation is offered on needs-based referral from a hospital department (physician or nurse) or a general practitioner [17]. Upon referral, patients are assigned a contact person at the centre who coordinates the needs assessment and adjusts the patient's rehabilitation programme (Figure 1). The centre was opened for rehabilitation services for patients with cancer of the breast, lung or colorectum in 2007 and for other cancer patients from 2009 onwards. Electronic registration of referrals and contacts was initiated for breast cancer patients in 2009 and for other patients from 2010.

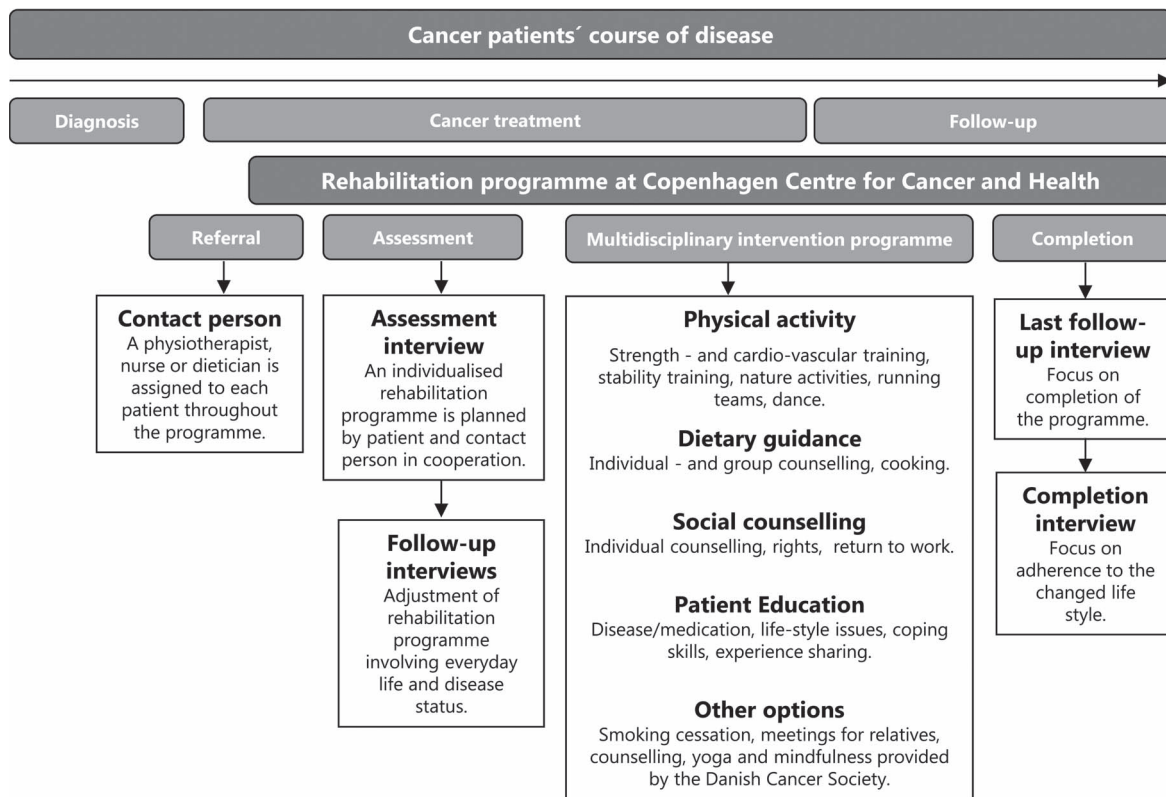


Figure 1. Rehabilitation services available between diagnosis and follow-up at the Centre for Cancer and Health, Copenhagen Municipality, Denmark.

Study population

Through the files of the Danish Cancer Registry which has recorded all cases of primary cancers diagnosed in Denmark since 1943 [18], we identified all 14 101 adults who might have been referred to the centre. These were patients with incident cancer (except non-melanoma skin cancer, in situ or benign urinary tract tumours and tumours 'not counted as cancer') diagnosed between 2007 and 2012, who resided in Copenhagen Municipality at the time of diagnosis. Cancer rehabilitation is primarily a municipality-based task in Denmark. In this study we only investigate the rehabilitation at the municipal rehabilitation centre and thus do not account for the minor part of rehabilitation services conducted at the hospitals, at private physiotherapists and general practitioners. Demographic (cohabitation status and children living at home) and socioeconomic characteristics (educational attainment and disposable income) were obtained by data linkage to the population-based Database for Labour Market Research, which holds such information since 1980 [19]. These variables were selected to cover related but different aspects of social influences on health: knowledge-related assets (education), material resources (income) and social support (cohabitation status and children living at home) [20,21]. Information on educational level and cohabitation status was included for the year of diagnosis, whereas information on disposable income and number of children living at home at the time of diagnosis was included for the year prior to diagnosis.

The outcome was having a record with a referral date to the Centre for Cancer and Health in the Municipal database of health information. We obtained information on referrals made in 2009–2012 for breast cancer patients referred in 2009 and for patients with cancer at any site referred in 2010–2012. We excluded 182 patients for whom information on socioeconomic factors was missing and a further 79 patients with a referral date prior to the date of cancer diagnosis.

Statistical analyses

We estimated hazard ratios (HRs) with 95% confidence intervals (CIs) for referral to rehabilitation according to socioeconomic factors using the Cox proportional hazard model in the statistical software R, version 3.0.2. [22]. Time since diagnosis was used as the underlying time scale. Patients were followed up from the date of cancer diagnosis until the date of referral, death from any cause, emigration or the end of follow-up (31 December 2012), whichever occurred first.

Crude HRs were estimated for the selected covariates to obtain an overview of possible associations between the covariates and the outcome of interest. The multivariate analysis was modelled in three steps. In the first model, we controlled for the potential confounding variables sex and age (in 10-year intervals). The second model was further adjusted for group of diagnosis (skin, buccal cavity and pharynx, digestive organs, respiratory system, breast, female genital organs, male genital organs, urinary tract, eye, brain and other parts of the central nervous system, lymphatic and haematopoietic tissue, and other). The third model also included the potentially mediating socioeconomic factors education [short (basic school, seven or nine years if born before or after 1958, respectively), medium (youth education or vocational education, 7–12 years), long (higher education, > 12 years) and unknown], disposable income (in quintiles), cohabitation status (married or cohabiting, divorced, widowed, living alone) and number of children living at home (0, 1, 2+).

Results

The study population comprised 13 840 patients with an incident primary cancer diagnosed in 2007–2012, providing 25 111 person-years and 2148 referrals for the analyses. Mean time from date of diagnosis to date of referral was 131 days (1st–3rd quartile: 15–158 days). Most of the patients were aged 60 or more; men and women were almost equally represented; and about one third of patients had short or medium education, one fifth had long education and length of education was unknown for 8% (Table I). Some 16% of the population was referred to rehabilitation, most of the referred patients were women (73%); most patients were aged 40–60 years (71%); and about half of the referred patients (47%) were breast cancer patients (data not shown).

Referral to rehabilitation after cancer

In unadjusted analyses, significant associations were found between cancer type and referral, and women were three times more likely to be referred than men (Table II). Statistically significant, stepwise increases in the HR for referral were seen with longer education, higher income and having more children living at home. Widows and widowers had a significantly reduced HR for referral.

After adjustment for sex and age and further adjustment for diagnosis, the associations became weaker but remained statistically significant, with HRs of 1.33 (95% CI 1.19–1.49) for patients with long and 1.15 (95% CI 1.03–1.29) for patients with

Table I. Characteristics of 13 840 people diagnosed with a total of 14 404 primary cancers in Copenhagen Municipality, Denmark, 2007–2012.

Total no. of cancer patients	Total (%)
	13 840 (100)
Period of diagnosis	
2007–2009*	6983 (50)
2010–2012	6857 (50)
Age at diagnosis (years)	
> 70	4949 (36)
61–70	3874 (28)
51–60	2312 (17)
41–50	1194 (9)
≤ 40	1511 (11)
Sex	
Male	6565 (47)
Female	7275 (53)
No. of cancers	
1	13 276 (96)
≥ 2	564 (4)
Cancer site	
Buccal cavity and pharynx	491 (4)
Digestive organs	2836 (20)
Respiratory system and intrathoracic organs	2093 (15)
Skin	1142 (8)
Breast	1976 (14)
Female genital organs incl. skin	764 (6)
Male genital organs incl. skin	1588 (11)
Urinary tract	588 (4)
Eye, brain and other parts of CNS	744 (5)
Lymphatic and haematopoietic tissue	938 (7)
Other**	680 (5)
Educational attainment***	
Short	4548 (33)
Medium	4820 (35)
Long	3383 (24)
Unknown	1089 (8)
Disposable income	
1 (lowest)	3870 (28)
2	3634 (26)
3	2036 (15)
4	1883 (14)
5 (highest)	2417 (17)
Cohabitation status	
Married	5314 (38)
Single	3240 (23)
Divorced	3028 (22)
Widowed	2238 (16)
No. of children living at home at time of diagnosis	
0	12 146 (88)
1	880 (6)
≥ 2	814 (6)
Referral	
Yes	2148 (16)
No	11 692 (84)

*50 patients with cancer diagnosed in 2006 were included in this group; **Cancer of the bones, joints and articular tissue, mesothelium and connective tissue, endocrine glands & ill-defined/unspecified cancers; ***Short (<7 or 9 years for patients born before or after 1958, respectively), medium (7–12 years) and long (>12 years).

medium education in comparison with those with basic education. Adjustment for cancer site decreased the HR of woman as compared with men substantially,

whereas age showed a stepwise association, younger patients having a higher HR for referral than older patients. Patients >70 years had a lower chance of referral, with an HR of 0.42 (95% CI 0.36–0.48) when compared with people aged 51–60 years.

Inclusion of socioeconomic and demographic factors did not change the statistically significant association with education, with HRs of 1.26 (95% CI 1.12–1.43) for long and 1.14 (95% CI 1.02–1.27) for medium as compared with basic education. Disposable income was not associated with the HR for referral in adjusted analyses. In the fully adjusted analyses, being female, being single and having two or more children living at home were associated with increased HRs for referral, whereas being young was associated with an increased HR of borderline significance, and being >70 years of age with a reduced HR for referral. As we included two cancer groups that are gender specific, interpretation of the results after adjustment for sex might be difficult. Therefore, we ran a sub-analysis in which patients with male or female genital cancers were excluded (2285 patients with 188 referrals); the effect estimates were virtually unchanged for all variables in models 3 and 4, and, specifically, the HR for women compared to men was 1.23 (95% CI 1.08–1.40). We performed another sub-analysis including cases diagnosed from 2009 onwards to investigate whether the association between education and referral existed only in the first years after the opening of the centre, again with virtually unchanged risk estimates (data not shown).

Discussion

Main findings

In this population-based study, we found a significant association between education and rate of referral to municipality rehabilitation after adjustment for sex, age, diagnosis and socioeconomic factors. We observed a higher referral rate among women than men, patients who were single, who had young children at home and among younger than older cancer patients. The findings support our hypothesis of social inequality in referral to rehabilitation services after a cancer diagnosis and thus suggest that the Danish healthcare system contributes to social inequality in cancer care.

Our finding of higher referral rate among patients with longer education is in line with findings of inequality by education in other parts of the cancer trajectory, such as in stage and time between referral and diagnosis [5,6,23], and the overall survival of Danish cancer patients [5,24]. Education may affect level of resources, cognition and health communication [20]; thus, the lower referral rate for patients with short education might be related to insufficient

Table II. Hazard ratios (HRs) and 95% confidence intervals (CIs) for referral to rehabilitation of patients with cancer diagnosed in 2007–2012, Copenhagen Municipality, Denmark.

Covariate	Model 1 ⁺ HR (95% CI)	Model 2 ⁺⁺ HR (95% CI)	Model 3 ⁺⁺⁺ HR (95% CI)	Model 4 ⁺⁺⁺⁺ HR (95% CI)
Sex				
Male	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Female	2.70 (2.46–2.97)	2.74 (2.49–3.02)	1.24 (1.09–1.41)	1.23 (1.09–1.41)
Age at diagnosis (years)				
51–60	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
≤ 40	0.66 (0.57–0.77)	0.63 (0.54–0.72)	1.24 (1.06–1.44)	1.16 (0.99–1.38)
41–50	1.18 (1.03–1.35)	1.08 (0.94–1.23)	1.15 (1.00–1.32)	1.08 (0.94–1.26)
61–70	0.69 (0.61–0.77)	0.77 (0.69–0.87)	0.85 (0.76–0.96)	0.89 (0.79–1.01)
> 70	0.32 (0.28–0.37)	0.36 (0.31–0.41)	0.42 (0.36–0.48)	0.45 (0.38–0.52)
Cancer site				
Skin	1.00 (ref.)		1.00 (ref.)	1.00 (ref.)
Buccal cavity and pharynx	8.60 (5.79–12.8)		11.5 (7.72–17.3)	11.7 (7.81–17.5)
Digestive organs	4.08 (2.82–5.89)		6.56 (4.51–9.55)	6.61 (4.54–9.63)
Respiratory system	7.36 (5.10–10.6)		11.6 (8.00–16.9)	11.8 (8.11–17.2)
Breast	27.0 (19.0–38.4)		32.2 (22.5–46.0)	32.2 (22.5–46.7)
Female genital organs	5.36 (3.60–7.96)		6.32 (4.24–9.45)	6.39 (4.28–9.54)
Male genital organs	1.88 (1.25–2.83)		2.97 (1.95–4.52)	2.97 (1.95–4.52)
Urinary tract	2.57 (1.60–4.13)		4.22 (2.60–6.84)	4.24 (2.62–6.88)
Eye, brain & other parts of CNS	2.74 (1.77–4.24)		3.13 (2.02–4.85)	3.13 (2.02–4.84)
Lymphatic & haematopoietic tissue	5.34 (3.62–7.88)		7.47 (5.04–11.1)	7.46 (5.04–11.0)
Other*	4.09 (2.60–6.21)		5.00 (3.23–7.74)	5.01 (3.24–7.75)
Level of education**				
Short	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)	1.00 (ref.)
Medium	1.17 (1.05–1.30)	1.15 (1.03–1.28)	1.15 (1.03–1.29)	1.14 (1.02–1.27)
Long	1.64 (1.47–1.82)	1.35 (1.20–1.51)	1.33 (1.19–1.49)	1.26 (1.12–1.43)
Unknown	0.43 (0.33–0.57)	0.52 (0.40–0.68)	0.52 (0.39–0.67)	0.51 (0.39–0.66)
Disposable income				
1 (lowest)	1.00 (ref.)			1.00 (ref.)
2	1.03 (0.91–1.17)			0.98 (0.86–1.12)
3	1.29 (1.12–1.49)			1.00 (0.87–1.12)
4	1.51 (1.32–1.73)			1.06 (0.92–1.23)
5 (highest)	1.63 (1.44–1.85)			1.11 (0.97–1.28)
Cohabitation status				
Married	1.00 (ref.)			1.00 (ref.)
Single	1.06 (0.96–1.18)			1.14 (1.02–1.21)
Divorced	1.00 (0.90–1.81)			1.02 (0.91–1.15)
Widowed	0.72 (0.62–0.83)			1.03 (0.87–1.21)
No. of children living at home at time of diagnosis				
0	1.00 (ref.)			1.00 (ref.)
1	1.83 (1.60–2.10)			1.13 (0.97–1.31)
≥ 2	1.88 (1.64–2.17)			1.18 (1.02–1.29)

⁺Model 1: crude HR (95% CI), ⁺⁺Model 2: adjusted for sex and age, ⁺⁺⁺Model 3: adjusted for sex, age and diagnosis & ⁺⁺⁺⁺Model 4: adjusted for sex, age, diagnosis, disposable income, cohabitation status and no. of children living at home.

*Cancer of the bones, joints and articular tissue, mesothelium and connective tissue, endocrine glands & ill-defined/unspecified cancers;

**Short (< 7 or 9 years for patients born before or after 1958, respectively), medium (7–12 years) and long (> 12 years).

knowledge about the rehabilitation services available and insufficient expression of a need for such services. Both studies from Denmark and other countries have indicated inequality in the need for and use of rehabilitation according to education [7–12,16]; however, to our knowledge, this is the first study in which referrals were used as a measure of access to rehabilitation services. Education was associated with referral rate, even when other socioeconomic, demographic and cancer-specific factors were accounted for, whereas income, which, although

related to education, can be taken as a measure of overall resources [20], was no longer associated with referral after adjustment for these factors.

In our study population, almost half the referrals were for patients with breast cancer, as reflected in the distribution of cancer types and gender. This was due mainly to the fact that rehabilitation services were available to this patient group at the centre before they were offered to other cancer patients from 2010 onwards. The high referral rate may also reflect good systematic needs assessment at the breast

cancer surgery department treating the majority of breast cancer patients in Copenhagen Municipality. Breast cancer patients are at high risk for severe functional problems after treatment and our findings that breast cancer patients had a higher referral rate agrees with the finding of another Danish study of participation in rehabilitation, in which breast cancer patients more often expressed a need for physical rehabilitation and were more likely to participate in activities than other cancer patients [3]. The fact that so many breast cancer patients are referred indicates, what potentially could be achieved among other patient groups if a systematic referral process was implemented at these hospital units.

Our finding of a difference in referral rate between women and men is similar to that of Holm et al., who found increased odds for women to participate in rehabilitation [17]. Men may articulate their needs less well or lack knowledge about the existence of rehabilitation. It is also possible that current rehabilitation services do not appeal to men, who would therefore turn down an offer of rehabilitation, as shown in a recent qualitative review among male cancer patients, which also found that male cancer patients prefer to use their work place and colleagues as rehabilitation [25].

Younger cancer patients had a higher referral rate than older patients, in line with the findings of other Scandinavian studies. In a Norwegian population-based study [2], increasing age was associated with less reported need for rehabilitation services such as psychological counselling but not for physical training. Holm et al. [17] showed that younger patients in general expressed a greater need for rehabilitation and suggested that younger individuals might have different challenges at this time of their lives than older patients, such as children still living at home, work or career concerns and a serious disease at an unexpectedly young age [3]. Elderly patients might have a greater need for rehabilitation because of higher prevalence of comorbidity and generally poorer health. One barrier to self-care among elderly cancer patients is, however, difficulty in communicating symptoms and worries related to cancer [26], and they might find it more difficult to identify rehabilitation needs. Living with a partner has been found to be protective against a need for rehabilitation, and individuals living alone reported greater needs for physical activity, psychological counselling, consultation with a social worker and admittance to a convalescent home than individuals living with a partner [2]. Our study showed that widowed patients in particular had a generally lower rate of referral to rehabilitation, which might indicate that cancer patients who live alone fail to articulate their need to a physician or lack the energy or social support to do so.

This is the first study to analyse access to rehabilitation from data on referral dates as the outcome measure, which is an objective measure of access to rehabilitation services based on identified need by a health professional. One strength of the present study is access to high-quality individual-level data on demographics, socioeconomic position, cancer site and referrals, ensuring almost complete follow-up and unbiased information [27]. The availability of information on various aspects of socioeconomic position also enabled us to study the effect of educational level while taking into account other important, possibly related socioeconomic characteristics. Further, we had access to a large population-based cohort of patients with newly diagnosed cancer, providing sufficient statistical power to detect clinically relevant differences in referral rates according to socioeconomic factors.

We did not have a measure of patient-rated rehabilitation needs and were thus not able to adjust for differing needs in the study population. However, the literature indicates that most cancer patients have rehabilitation needs [1–3,13,16], and the need for rehabilitation might be expected to be higher among individuals with short education, who tend to have late-stage disease and therefore more invasive treatment. We did not have information on stage at diagnosis or prognosis, which could affect health professionals' decision to offer referral for rehabilitation, perhaps because the patient is judged to be too ill to gain from rehabilitation services and is instead offered palliative care. Referral to palliative care may be especially relevant among late stage patients. If disadvantaged individuals are diagnosed with higher stage as previously shown [8] and referred to relevant palliative care, this could possibly account for a minor part of the inequality by education we observe.

In conclusion, our findings suggest that referral to cancer rehabilitation services is not equally distributed according to socioeconomic group, even after accounting for differences in demographics and cancer characteristics. Higher educational level is associated with a higher referral rate to rehabilitation services, supporting the hypothesis that there is social inequality in referral and access to rehabilitation, which can be an important intervention during and after cancer. The finding is important, as it suggests that the Danish healthcare system contributes to social inequality in access to cancer rehabilitation, which has been proven to have a positive effect on the quality of life of cancer survivors. As access to rehabilitation services requires a referral from a clinician, our findings should alert health professionals to pay attention to cancer patients with short education in terms of needs assessment and access to adequate rehabilitation services.

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