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Quality of life in patients with cancer during the COVID-19 pandemic – a Danish cross-sectional study (COPICADS)

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Abstract

Background

The COVID-19 pandemic is an international public health crisis. The risk of getting an infection with COVID-19 might impact the emotional well-being in patients with cancer. The aim of this study was to investigate quality of life (QoL) for patients with cancer during the COVID-19 pandemic.

Patients and Methods

A cross-sectional survey, including questions about demographics, concerns of COVID-19 impact on cancer treatment and outpatient clinic visits, and the European Organization for Research and Treatment of Cancer (EORTC) QLQ-C30 questionnaire was sent to patients with cancer at the Department of Oncology, Odense University Hospital, Denmark. The survey was open from 15th May to 29th May 2020, and 4,571 responded. Results were compared to the Danish ‘Barometer Study’ conducted by the Danish Cancer Society to elucidate experiences with the Danish healthcare system prior to COVID-19 pandemic.

Results

In total, 9% of patients with cancer had refrained from consulting a doctor or the hospital due to fear of COVID-19 infection, and 80% were concerned about contracting COVID-19 to some extent. Seventeen patients were tested positive for COVID-19. The mean global QoL and emotional

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functioning (EF) scores were 71.3 and 82.8, respectively. In comparison to the 'Barometer Study', no clinical significant differences in QoL and EF scores were observed. Multivariate analysis demonstrated that being 'Concerned about contracting corona-virus' was correlated with lower QoL and EF scores. Factors associated with being concerned of contracting COVID-19 were comorbid conditions, incurable cancer, receiving medical cancer treatment and female gender.

Conclusion

Danish patients with cancer during the COVID-19 pandemic did not have lower scores of QoL and emotional functioning compared to the Danish 'Barometer Study'. However, the study suggests that concerns of contracting COVID-19 was correlated with lower scores of QoL.

Introduction

Since the detection of the novel coronavirus (COVID-19) in December 2019, it has caused massive impact on the healthcare system worldwide. The outbreak of COVID-19 was categorized as a global pandemic in March 2020 [1]. In order to limit the spread of this disease, the Danish government ordered a national lockdown, closing educational institutions, kindergartens and other public services [2]. All employees in the private or public sector were urged to work from home and social distancing was highly recommended during the COVID-19 pandemic [2].

Patients with cancer may be seriously impacted by the COVID-19 since the cancer and antineoplastic treatment often weaken the immune system, which potentially could lead to high risk of serious illness and complications [3]. However, no data are available regarding higher incidence of COVID-19 in patients with cancer [3]. Increasing numbers of comorbidities including a cancer diagnosis and increasing age seem to be associated with higher mortality of COVID-19 infection [4,5]. Patients with cancer might be practicing social distancing even more than the general population, which can lead to anxiety, depression, and the feeling of loneliness [6,7]. These factors might affect quality of life (QoL).

European recommendations have been conducted to help clinicians deal with various aspects of cancer care during the COVID-19 pandemic [3,8]. It is recommended by the European Society for Medical Oncology (ESMO) and the European Society for Radiotherapy and Oncology (ESTRO) to minimize hospital appointments for patients with cancer. The recommendations include converting

follow-up programs for outpatient clinic visits to phone-calls, or even postponing visits [3,8]. To mitigate the risk of COVID-19, these recommendations have been complied with at the Department of Oncology at Odense University Hospital (OUH), Denmark.

In 2017, the Danish Cancer Society conducted a large study called the “Barometer Study” in order to elucidate the experience of Danish cancer patients with the Danish healthcare system including the European Organization for Research and Treatment of Cancer (EORTC) Quality-of-Life-Questionnaire-Core-30 (QLQ-C30 QoL) questionnaire in the survey [9]. A follow-up study in the same population was performed in 2019 [9]. Therefore, much information regarding QoL in Danish patients with cancer is already available. However, only sparse information is available regarding the consequences of a pandemic in patients with cancer. We hypothesized that patients with cancer may worry that their antineoplastic treatment will be discontinued or changed due to reduction of visits at the outpatient clinics. It is therefore of interest to explore the patients’ QoL and to investigate concerns of COVID-19 pandemic impact on cancer treatment and follow-up programmes.

This aim of the study was to investigate QoL for patients with cancer, either receiving active treatment or in a follow-up program during the COVID-19 pandemic with special focus on emotional functioning. This was achieved by investigating the QoL in Danish cancer patients during the COVID-19 pandemic compared to the “Barometer Study” [9]. The secondary aim was to investigate if patients with cancer had concerns of contracting COVID-19.

Materials and Methods

This study was an observational cross-sectional cohort survey. The study participants were recruited at the Department of Oncology, OUH, Denmark.

Patients and settings

Annually, approximately 5,400 patients are referred to the Department of Oncology, OUH, Denmark. Patients from the Region of Southern Denmark and Region of Zealand can be referred to cancer treatment at the Department of Oncology, OUH, Denmark. Health care services, including medication and admission to hospitals in Denmark are free for inhabitants in Denmark.

Patients with a solid cancer diagnosis receiving active cancer treatment or in follow-up program at the Department of Oncology, OUH, Denmark, were invited to participate in the survey. The participants had to be able to complete the questionnaire sent electronically via 'e-Boks' -- a secure electronic mailbox used to receive digital mail from the private and public sectors. Participation was voluntary and anonymous. Participants were not offered financial compensation for filling out the survey. Data was filed and stored in REDCap. Central storage of patient data was administered by a Clinical Research Unit in Region of Southern Denmark (OPEN) [10].

In total, a list of 10,151 patients was handed out to the investigators of this study. Of these, 109 patients had received radiotherapy for hematological disease and were excluded since a similar QoL survey was conducted at the Department of Hematology. A total of 470 patients with breast cancer were excluded since they did not have an active follow-up program at the department. Of the

remaining 9,572 patients, 1,477 patients did not have e-Boks and were excluded. Due to technical issues, 21 patients did not receive the survey leaving the total study population of 8,074 patients.

Study design

Data was collected from May 15th 2020 to May 29th 2020, and participant consent was obtained in connection with the recruitment. No secondary reminder was sent. All data was analyzed in June 2020.

An online Danish survey was created for the purpose. It consisted of questions on demographics, concerns of COVID-19 impact on cancer treatment and outpatient clinic visits, and the EORTC QLQ-C30 questionnaire [11]. The survey was pilot tested in a group of 10 patients with cancer, to avoid misinterpretations of questions and instructions to the survey. Adjustments were made to the final version of the survey, including a more detailed written introduction. According to guidelines proposed by Beaton and colleagues, every item in the survey was translated forward to English and backward to Danish solely for the reason of publication [12]. For the full-created survey, please see appendix 1.

The present study's results were compared to the 'Barometer Study' prior to COVID-19 pandemic [9].

Health-related quality of life – the QLQ-C30 questionnaire

The EORTC QLQ-C30 is a standardized cancer-specific 30-itemed instrument with a four-point scale, from 'not at all' to 'very much,' for items 1 to 28; and a seven-point scale for items 29 and 30, which ranges from one (very

poor) to seven (excellent) [11]. The QLQ-C30 dimensions include: the physical functioning (PF), role functioning (RF), cognitive functioning (CF), emotional functioning (EF), social functioning (SF), and the general level of QoL and the symptoms scale (i.e., fatigue, pain). Scores are transformed linearly to a zero to 100 scale [13]. A higher score on the functional scale and the global HRQoL indicates better functioning, while a higher score on the symptom scales indicates worse functioning. The Danish version of EORTC QLQ-C30 questionnaire is validated and widely used, and reference values to the Danish general population has been published [14].

In the current study, the items addressing global quality of life and health: ‘How would you rate your overall health during the past week?’ and ‘How would you rate your overall quality of life during the past week?’ were used to get a pure expression of QoL and the scale of emotional functioning.

Statistical analysis

Standard descriptive statistics expressed as means and percentages, were performed to summarize the responses to all survey questions. For the validated EORTC QLQ-C30 questionnaire the scores were described according to scoring guidelines using means and standard deviation (SD) [13]. The EORTC QLQ-C30 scoring manual was used for the functional scales and symptom scores [15]. Internal consistency was evaluated by calculating Cronbach's alpha, which was considered as indicating good internal consistency with a value more than 0.7. The EORTC QoL results of this study were compared with results from the ‘Barometer Study’. The concept of minimally important difference (MID) enables

interpreting differences and changes in QoL scores in terms of clinical meaningfulness. As proposed by Osoba et al. the MID for comparison in this study was to detect a small change of 5--10 points on the global QoL scale [16].

Simple linear regression analyses were performed to evaluate the relationship between patients' characteristics and the emotional functioning (EF) and global QoL scores. A multiple regression analysis was performed to evaluate the relationship between patients' characteristics with the EF and global QoL scores to detect factors that might have affected the EORTC QLQ-C30 scores. The following subgroups were anticipated to influence QoL and EF scores and were included in the regression analyses: gender (male vs. female), age (18-59, 60-69, 70-79, 80+), marital status (married/living together vs. involved/divorced/widow/widower/single), household (living alone vs. not living alone), education (elementary school, vocational basic course/general upper secondary education/business upper secondary education, short-cycle higher/medium-cycle higher education, long-cycle higher education), work situation (full-time/part-time/self-employed/student, homemaker/on leave, unemployed/on sick-leave receiving sickness benefits/disablement rehabilitation, early retirement benefit/on retirement pension), and comorbid conditions (0, 1, 2+). Tests for interaction between covariates (gender, age, marital status, household, education, comorbidity, cancer diagnosis, cancer status (curable/incurable), radiotherapy or medical cancer treatment within the last two months) in the multiple regression analyses were performed. Patients with missing data were excluded from the regression analyses. Chi² was used to test differences between groups of patients with concerns (a little concerned to extremely

concerned) or without concerns of contracting COVID-19. P values less than 0.05 were considered statistically significant throughout. STATA version 16 (StataCorp 2019) was used for the statistical analyses.

Ethical Considerations

All participants received written information about the study procedures. If the patients had additional questions to the study, contact information (phone and work address) of the investigators was given in the information letter.

The project was registered on the Region of Southern Denmark's record of data processing activities (J.nr. 20/21708). All personal data were handled in accordance with EU GDPR, The Danish Data Protection Act and The Danish Health Act. According to the Committees on Health Research Ethics in Denmark, questionnaires are not to be endorsed by the authorities. Approval for sending the questionnaire to the patients in the study was obtained from the Danish Health Authorities (J.nr. 31-1521-335).

The principles of the Helsinki Declaration were followed. The study was registered at www.clinicaltrials.gov with identifier number NCT04389996. The current study had authorization to use the EORTC QLQ-C30 questionnaire.

Results

Overall, 8,074 patients received the questionnaire. Patients without e-Boks not receiving the questionnaire had a mean age of 75 (24-108), and 40% were men. The mean age of the group of patients with e-Boks who did receive the questionnaire was 64 (17-98), and 41% were men. In total, 4,571 (57%) agreed to

participate in the study. No information of the reason for non-participation was available.

The mean age of patients who responded to the questionnaire was 66 years, and 40% were men. Of the patients, 30% had breast cancer and 22% of all patients had incurable cancer. The proportion of patients with planned treatment of radiotherapy or systemic antineoplastic treatment within the last 2 months was 7% and 34%, respectively. For further patient characteristics, see table 1.

As shown in table 2, 9% of all patients with cancer had refrained from consulting a doctor or the hospital due to fear of COVID-19 infection, and 80% of the study population was concerned about contracting COVID-19 to some extent. In total, 44%, 58%, and 65% of the patients could imagine future doctor appointments replaced by video-consultation, telephone contact, and mail-correspondence, respectively. Seventeen patients reported positive test of COVID-19.

The EORTC QLQ-C30 mean global QoL score was 71.3 and the mean score for the functional scale of EF was 82.8. A comparison to the 'Barometer Study' revealed no clinical significant differences in global QoL and EF scores with 71.9 vs. 74.4 and 82.8 vs. 84.4, for baseline and 2½-years follow-up, respectively. The rest of the EORTC QLQ-C30 functional scale scores are presented in table 3. The EORTC QLQ-C30 functional scales had excellent internal consistency with a Cronbach's alpha coefficient of approximately 0.9 for all scores.

For multiple variate regression analyses, thyroid cancer was used as index cancer since its EF score was the closest to the mean value of the total cancer

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population (table 4). Male gender, increasing age, fewer comorbid conditions, and not receiving treatment within the last two months were correlated with higher EF scores. Having a brain tumor was correlated with lower EF score compared to having thyroid cancer (P-value <0.05), whereas malignant melanoma was correlated with higher EF (P-value <0.05). Higher global QoL score was correlated with increasing age, not living alone, full-time/part-time/self-employed, fewer comorbid conditions, and not receiving treatment within the last two months. Patients with brain tumors, endometrial/cervical/vulva cancers, and thoracic cancers had lower global QoL scores than thyroid cancer (P-value <0.05). Being 'Concerned about contracting corona-virus' was correlated with lower EF and QoL scores. Compared with 'Not concerned', the coefficient for EF and global health QoL ranged from -5.21 to -25.02, and -4.66 to -20.58, respectively for 'A little concerned' to 'Extremely concerned'. No interactions between covariates were found in the multiple variate regression analyses for both EF and QoL.

Sociodemographic and disease related parameters for the group of patients who were not concerned vs. concerned of contracting COVID-19 are presented in table 5. Factors associated with being concerned of contracting COVID-19 were comorbid conditions, incurable cancer, receiving medical cancer treatment and female gender. Marital status, household situation, education level, work situation, and receiving radiotherapy within the last two months did not influence the concerns of contracting COVID-19.

Discussion

The aim of this study was to investigate QoL in Danish patients with cancer during the COVID-19 pandemic. The findings of this study showed that global QoL and EF for patients with cancer in Denmark did not differ from previous findings in the Danish “Barometer Study”. However, the results did suggest that concerns of contracting COVID-19 infection were correlated with lower scores of global QoL and the emotional functioning scale.

Data from previous studies indicates that increasing age and an increasing number of comorbidities are strong predictors of mortality in COVID-19 positive patients [4,5]. Lee et al. studied COVID-19 mortality in patients with cancer, N=800, but did not find an association between patients on cytotoxic chemotherapy or other anticancer treatment and the risk of COVID-19 mortality [17]. Reilev et al. studied predictors of hospitalization and death in the first 9,515 cases of COVID-19 in Denmark [4]. They found that having cancer was linked to a statistically significant increased risk of hospitalization (OR=1.3) and death (OR=1.3) in case of a positive COVID-19 test when adjusting for age and gender. This indicates a true association between a cancer diagnosis and a serious course of COVID-19 infection.

Based on the present study it is not possible to conclude if social distancing as recommended by the Danish Government and precautions taken to minimize the number of face-to-face appointments at the Department of Oncology, OUH, Denmark were effective in minimizing spread of COVID-19. Interestingly, only 17 patients out of 4,571 (< 1%), reported having a positive test of COVID-19. In comparison, approximately 1.6% of the population tested in

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Denmark were positive for COVID-19 [18]. Also, a study investigating the concerns of contracting COVID-19 in Dutch patients with cancer did also find a low incidence of positive cases of COVID-19 [19].

Previous studies reported that persons quarantined because of increased risk of infections with a serious illness, more often report symptoms of emotional disturbance, stress, and depression [6]. A study by Qian et al. performed during the COVID-19 pandemic demonstrated that more than half of cancer patients had anxiety, depression, or COVID-19 related fear [20]. In addition, the Dutch study reported that most patients were concerned about the impact of the COVID-19 pandemic on treatment and follow-up [19]. These studies are supported by data from our study demonstrating that 80% of the patients were concerned about contracting COVID-19, and that this was correlated with lower scores of QoL and EF. As seen in the Dutch study, we found that patients with incurable cancer were more concerned about contracting COVID-19 [19]. However, our data did not indicate that patients' QoL and emotional functioning were affected during the COVID-19 pandemic compared to previous Danish data [21]. This could be due to patients feeling safe while the entire Danish population was practicing social distancing and the Department of Oncology, OUH, Denmark was taking precautions to minimize physical attendance. Another reason could be that the cancer diagnosis is affecting QoL and EF scores more than the risk of COVID-19. Finally, this study was conducted after Denmark started reopening, which could have affected QoL and EF since the reproduction rate of COVID-19 had decreased in Denmark, compared to the beginning of the COVID-19 pandemic.

On the other hand, the reopening of society could also lead to more anxiety since the risk of contamination of COVID-19 might increase.

The precautions taken to minimize attendance during the COVID-19 pandemic could have implications to the future out-patient clinic in the Department of Oncology, OUH, Denmark, since more than half the patients' are positively welcoming having phone-calls or video consultations, or even a letter with the result of an examination. This implies that patients felt well-taken care of during the COVID-19 pandemic and this could result in future reorganization of outpatient clinic with personalized flexible follow-up programs that could potentially optimize use of the resources and ultimately create a better patient experience.

Limitations of this study include lack of baseline data prior to the COVID-19 pandemic. However, data from the Danish 'Barometer Study' included a national cohort of patients with similar baseline characteristics and offered the second best possibility [9]. Recognizing that patients with more resources are often the responders to this type of study, firm conclusions cannot be drawn from our results due to potential selection bias. In addition, 1,477 patients did not have 'e-Boks' and data from this group of patients could have influenced the results of this study since these were mainly older patients, representing a potential frail group with more comorbid conditions, which might be more affected than younger patients. Optimally, data should had been collected when the COVID-19 infection pressure was at its maximum in Denmark. The reopening of Denmark was effectuated on April 15 and this may reflect patients QoL and emotionally status in the present study. Whether EORTC QLQ-C30 is the best instrument to

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measure the well-being and levels of distress in patients during a serious pandemic, is unknown. In future studies it would be relevant to explore if other tools could bring additional information on the emotional wellbeing of patient with cancer during the pandemic. As the COVID-19 presumably will remain a challenge for a very long time, a follow-up assessment detecting long time implications of the COVID-19 pandemic on QoL would be relevant.

In conclusion, the Danish patients with cancer in this study had comparable QoL and emotional functioning scores compared to the Danish 'Barometer Study'. However, this study suggested that concern of contracting COVID-19 infection was correlated with lower scores of QoL and EF. QoL data from countries with a higher reproduction rate of COVID-19 might differ from results from this study and it would be interesting to see results from other QoL studies in the future.

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Disclosure of interest

The authors report no conflicts of interest.

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Table 1. Patient characteristics

Patient characteristics (N=4,571)	
	N (%)
Gender (N=4.570)	
Male	1.830 (40)
Female	2.734 (60)
I do not identify myself with a specific gender	6 (<1)
Age (N =4.081)	
18-29	38 (1)
30-39	111 (3)
40-49	306 (7)
50-59	816 (20)
60-69	1.283 (31)
70-79	1.251 (31)
80-89	263 (6)
90+	13 (<1)
Marital status (N=4.571)	
Married/living together	3.337 (73)
Involved, not living together	136 (3)
Divorced	234 (5)
Widow/widower	391 (9)
Single	462 (10)
Other	11 (<1)
Household (N=4.571)	
1 I live alone	1.101 (24)
2	2.827 (62)
3	331 (7)
4	228 (5)
4+	84 (2)
Education (N=4.571)	
Elementary school	814 (18)

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Vocational basic course	652 (14)
General upper secondary education	132 (3)
Business upper secondary education	82 (2)
Short-cycle higher education (< 3 years)	724 (16)
Medium-cycle higher education (3-4 years)	1.442 (31)
Long-cycle higher education (>4 years)	493 (11)
Other	157 (3)
I don't want to answer/I don't know	75 (2)
Work situation (N=4.561)	
Employed full-time	1.459 (32)
Employed part-time	302 (7)
Self-employed	231 (5)
Housemaker	47 (1)
Unemployed	61 (1)
On leave	8 (<1)
On sick-leave receiving sickness benefits	72 (2)
Disablement rehabilitation	10 (<1)
Early retirement benefit	249 (5)
On retirement pension	1.924 (42)
Student/ apprentice	36 (1)
Other (please note)	143 (3)
I don't want to answer/I don't know	20 (<1)
Cancer diagnosis (N =4.571)	
Urogenital cancer	101 (2)
Prostate cancer	213 (5)
Testicular cancer	102 (2)
Breast cancer	1.203 (26)
Endometrial/cervical/vulva cancer	132 (3)
Ovarian cancer	118 (3)
Upper GI cancer	204 (4)
Colorectal cancer	110 (2)

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Brain tumor	41 (1)
Thoracic cancer	458 (10)
Head and neck cancer	306 (7)
Thyroid cancer	152 (3)
Malignant melanoma	409 (9)
Skin cancer	160 (4)
Lymphoma/myelomatosis	50 (1)
Other/unknown primary cancer	65 (1)
More than 1 cancer (range 2-6)	727 (16)
I don't want to answer/I don't know	20 (<1)
Comorbid conditions (N=4.571)*	
Hypertension	1.609 (35)
Cardiovascular disease	366 (8)
Diabetes	218 (9)
Chronic lung disease (COPD/Asthma)	541 (12)
Kidney disease	88 (2)
Liver disease	29 (1)
None of the above	2.276 (50)
I do not wish to answer/don't know	111 (3)
Electronic devices at home (N =4.571)*	
Smartphone/cellphone	4.369 (96)
Desktop or laptop computer	3.835 (84)
Tablet/Ipad	2.888 (63)
Internet access at your home	3.932 (86)
Landline phone	1.064 (23)
I don't want to answer/I don't know	14 (<1)
Cancer status (N=4.571)	
Curable	3.311 (72)

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Incurable 995 (22)

I don't want to answer/I don't know 265 (6)

Radiotherapy within last 2 months (N=4.571)

Yes 326 (7)

No 4.231 (93)

I don't want to answer/I don't know 14 (<1)

Medical cancer treatment within last 2 months (N=4.571)

Yes 1.538 (34)

No 2.984 (65)

I don't want to answer/I don't know 49 (1)

*possible to check more than one box resulting in total of more than 100%

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Table 2. The experience of the COVID-19 pandemic in Danish patients with cancer

	<i>N</i> (%)
Have you refrained from consulting a doctor or the hospital due to fear of corona-virus infection? (<i>N</i> =4,571)	
Yes	414 (9)
No	4,113 (90)
I do not wish to answer/ I don't know	44 (1)
Are you concerned about contracting corona-virus? (<i>N</i> =4,571)	
Not concerned	914 (20)
A little concerned	1,549 (34)
Moderately concerned	1,278 (28)
Very concerned	703 (15)
Extremely concerned	120 (3)
I do not wish to answer/I don't know	7 (<1)
Have you been tested for corona-virus at any time? (<i>N</i> =4,571)	
Yes, I have been tested, and the test was positive	17 (<1)
Yes, I have been tested, and the test was negative	537 (12)
No, I have not been tested although I had symptoms	188 (4)
No, I have not been tested since I have not had symptoms	3,801 (83)
I do not wish to answer/I don't know	28 (<1)
How concerned are you, that the corona-epidemic may affect your cancer treatment? (<i>N</i> =1,697)	
Not concerned	674 (40)
A little concerned	463 (27)
Moderately concerned	331 (20)
Very concerned	185 (11)
Extremely concerned	33 (2)
I do not wish to answer/I don't know	11 (<1)
Could you imagine turning up for a doctor's appointment at the department of oncology was replaced by a telephone consultation? (<i>N</i> =4,571)	
Yes	741 (16)
Yes, but not every time	1,933 (42)

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No	1,782 (39)
I do not wish to answer/I don't know	115 (3)
Could you imagine turning up for a doctor's appointment at the department of oncology was replaced by a video-consultation? (N =4,571)	
Yes	571 (12)
Yes, but not every time	1,456 (32)
No	2,423 (53)
I do not wish to answer/I don't know	121 (3)
Could you imagine having a scan result sent to you by mail if the result was good? (N =2,830)	
Yes	1,398 (49)
Yes, but not every time	448 (16)
No	493 (17)
I do not have scans as part of my follow-up procedure	424 (15)
I do not wish to answer/I don't know	67 (2)

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Table 3. EORTC QLQ-C30 quality of life for Danish patients with cancer during COVID-19 pandemic

EORTC QLQ-C30	COPICADS			The Danish "Barometer Study"	
	2020		Cronbach's alpha coefficient*	2017	2019
	Mean N=4571	SD		Mean N =5314	Mean N =3153
Global health status/QoL	71.3	21.4	0.89	71.9	74.4
Functional scales**					
Physical functioning	81.4	21.1	0.89	82.8	86.2
Role functioning	77.8	27.4	0.89	76.5	80.3
Emotional functioning	82.8	18.8	0.90	82.8	84.4
Cognitive functioning	85.4	18.8	0.90	84.0	85.8
Social functioning	85.3	19.4	0.89	86.5	88.3
Symptom scales***					
Fatigue	28.9	24.4	0.88		
Nausea and vomiting	5.0	12.5	0.91		
Pain	19.4	24.5	0.89		
Dyspnea	16.0	24.7	-		
Insomnia	24.2	27.4	-		
Appetite loss	10.8	22.7	-		
Constipation	11.1	21.1	-		
Diarrhea	10.2	20.0	-		
Financial difficulties	5.8	17.3	-		

* Alpha values ≥ 0.70 indicate adequate scale reliability

** scores range from 0 to 100, with a higher score representing a higher level of functioning

*** scores range from 0 to 100, with a higher score representing a greater degree of symptoms

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Table 4. Multiple regression analysis of the EF domain and global health QoL of the EORTC QLQ-C30

	QLQ-C30; EF			QLQ-C30; global health QoL		
	Coefficient	95% CI	P-value	Coefficient	95% CI	P-value
Gender						
Male	0			0		
Female	-2.34	-3.75;-0.93	0.001	0.01	-1.58;1.61	0.99
Age at survey						
18-59	0			0		
60-69	4.24	2.75;5.73	<0.001	4.79	3.10;6.47	<0.001
70-79	6.05	4.21;7.89	<0.001	6.02	3.94;8.10	<0.001
80+	7.93	5.29;10.57	<0.001	3.09	0.11;6.07	<0.05
Marital status						
Married/living together	0			0		
Involved/divorced/widow/widower/single	0.66	-2.04;3.36	0.63	-0.12	-3.18;2.93	0.94
Household						
Living alone	0			0		
Not living alone	1.60	-1.23;4.43	0.29	3.62	0.42;6.82	<0.05
Education						
Elementary school	0			0		
Vocational basic course/General upper secondary education/Business upper secondary education	2.02	0.24;3.81	<0.05	-0.16	-2.18;1.85	0.88
Short-cycle higher/Medium-cycle higher education	2.32	0.80;3.84	<0.05	0.52	-1.21;2.24	0.56
Long-cycle higher education (>4 years)	1.86	-0.21;3.93	0.08	-0.05	-2.39;2.29	0.97
Work situation						
Full-time/part-time/self-employed/student	0			0		
Homemaker/on leave	-2.29	-7.49;2.92	0.39	-2.24	-8.13;3.64	0.45
Unemployed/on sick-leave receiving sickness benefits/disablement rehabilitation	-12.51	-15.53;-9.50	<0.001	-12.61	-16.02;-9.21	<0.001
Early retirement benefit/on retirement pension	-0.66	-2.09;0.77	0.37	-2.31	-3.93;-0.69	<0.05
Cancer diagnosis						
Thyroid cancer	0			0		
Urogenital cancer	-0.53	-5.14;4.07	0.82	-2.38	-7.59;2.82	0.37
Breast cancer	0.63	-2.41;3.67	0.68	-1.58	-5.02;1.86	0.37
Upper GI cancer	-0.85	-4.69;3.00	0.66	-3.30	-6.64;2.04	0.30
Brain tumor	-7.20	-13.37;-1.03	<0.05	-10.48	-17.45;-3.50	<0.05
Head and neck cancer	0.79	-2.72;4.30	0.66	-1.33	-5.29;2.64	0.51
Skin cancer	0.59	-3.41;4.60	0.77	2.32	-2.21;6.85	0.32

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Endometrial/cervical/vulva cancer	-2.73	-6.87;1.42	0.20	-6.74	-11.43;-2.06	<0.05
Thoracic cancer	0.47	-2.89;3.82	0.79	-2.69	-6.48;1.10	0.16
Lymphoma/myelomatosis	5.53	-0.10;11.16	0.05	4.17	-2.19;10.53	0.20
Malignant melanoma	3.37	0.08;6.66	<0.05	3.19	-0.53;6.91	0.09
Prostate cancer	0.70	-3.24;4.63	0.73	0.38	-4.07;4.82	0.87
Testicular cancer	0.33	-4.12;4.79	0.88	2.13	-2.91;7.16	0.41
Ovarian cancer	-0.74	-5.07;3.60	0.74	-1.96	-6.86;2.94	0.43
Colorectal cancer	-2.74	-7.08;1.59	0.22	-2.39	-7.29;2.52	0.34
Other/unknown primary cancer	0.37	-5.01;5.75	0.89	-3.10	-9.18;2.98	0.32
More than 1 cancer (range 2-6)	-1.21	-4.39;1.97	0.46	-3.66	-7.25;-0.06	<0.05
Comorbid conditions						
0	0			0		
1	-1.23	-2.45;-0.01	<0.05	-3.39	-4.47;-2.02	<0.001
2+	-2.28	-3.92;-0.63	<0.05	-7.72	-9.58;-5.86	<0.001
Curable cancer						
Yes	0			0		
No	-4.46	-6.01;-2.91	<0.001	-7.88	-9.63;-6.13	<0.001
Radiotherapy within last 2 months						
No	0			0		
Yes	-4.12	-6.22;-2.02	<0.001	-4.94	-7.31;-2.56	<0.001
Medical cancer treatment within last 2 months						
No	0			0		
Yes	-0.24	-1.52;1.04	0.71	-4.34	-4.34;-1.44	<0.001
Concerned about contracting corona-virus						
Not concerned	0			0		
A little concerned	-5.21	-6.70;-3.73	<0.001	-4.66	-6.14;-2.79	<0.001
Moderately concerned	-8.88	-10.44;-7.32	<0.001	-8.47	-10.23;-6.71	<0.001
Very concerned	-16.92	-18.76;-15.08	<0.001	-13.90	-15.98;-11.82	<0.001
Extremely concerned	-25.02	-28.48;-21.56	<0.001	-20.58	-24.50;-16.67	<0.001
_cons	88.03			80.75		
N	4.075			4.075		
R²	0.200			0.207		

Table 5. Patient concerns of contracting COVID-19

Patient concerns (n=4,564)			
	Not concerned (%)*	Concerned (%)**	p-value
Gender (n=4.558)			
Male	434 (24)	1.391 (76)	
Female	479 (18)	2.254 (82)	<0.05
Age (n=4.081)			
18-29	16 (42)	22 (58)	
30-39	30 (27)	81 (73)	
40-49	96 (31)	210 (69)	
50-59	185 (23)	630 (77)	
60-69	194 (15)	1.087 (85)	
70-79	227 (18)	1.023 (82)	
80-89	67 (25)	196 (75)	
90+	3 (25)	9 (75)	<0.05
Marital status (n=4.564)			
Married/living together	659 (20)	2.674 (80)	
Involved/divorced/widow/widower/single	255 (21)	976 (79)	0.48
Household (n=4.564)			
I live alone	229 (21)	869 (79)	
I do not live alone	685 (20)	2.781 (80)	0.43
Education (4.332)			
Elementary school	169 (21)	641 (79)	
Vocational basic course/General upper secondary education/Business upper secondary education	177 (20)	689 (80)	

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Short-cycle higher/Medium-cycle higher education	425 (20)	1.739 (80)	
Long-cycle higher education (>4 years)	101 (21)	391 (79)	0.87
Work situation (n=4.392)			
Full-time/part-time/self-employed/student	441 (22)	1.583 (78)	
Homemaker/on leave	11 (20)	44 (80)	
Unemployed/on sick-leave receiving sickness benefits/disablement rehabilitation	26 (18)	116 (82)	
Early retirement benefit/on retirement pension	406 (19)	1.765 (81)	0.09
Cancer diagnosis (n=4.545)			
Urogenital cancer	14 (14)	87 (86)	
Breast cancer	228 (19)	974 (81)	
Upper GI cancer	27 (13)	176 (87)	
Brain tumor	7 (17)	34 (83)	
Head and neck cancer	75 (25)	230 (75)	
Skin cancer	48 (30)	112 (70)	
Endometrial/cervical/vulva cancer	22 (17)	110 (83)	
Thoracic cancer	62 (14)	394 (86)	
Lymphoma/myelomatosis	10 (20)	40 (80)	
Malignant melanoma	110 (27)	299 (73)	
Prostate cancer	38 (18)	174 (82)	
Thyroid cancer	39 (26)	113 (74)	
Testicular cancer	45 (45)	57 (56)	
Ovarian cancer	13 (11)	105 (89)	
Colorectal cancer	22 (20)	88 (80)	

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Other/unknown primary cancer	18 (28)	47 (72)	
More than 1 cancer (range 2-6)	129 (18)	598 (82)	<0.05
Comorbid conditions (n=4.564)			
0	561 (24)	1.802 (76)	
1	260 (17)	1.265 (83)	
2+	93 (14)	583 (86)	<0.05
Cancer status (n=4.564)			
Curable	744 (22)	2.565 (78)	
Incurable	134 (13)	859 (87)	
I don't want to answer/I don't know	36 (14)	226 (86)	<0.05
Radiotherapy within last 2 months (n=4.564)			
Yes	56 (17)	268 (83)	
No	855 (20)	3.372 (80)	
I don't want to answer/I don't know	3 (23)	10 (77)	0.43
Medical cancer treatment within last 2 months (n=4.564)			
Yes	222 (14)	1.313 (86)	
No	681 (23)	2.300 (77)	
I don't want to answer/I don't know	11 (23)	37 (77)	<0.05

* Patients reported "Not concerned"

** Patients reported from "A little concerned" to "Extremely concerned"
