Patient-Reported Experiences and Associated Factors in a Norwegian Radiotherapy Setting: An Explorative Cross-Sectional Study

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Abstract

Introduction: Radiotherapy is the main treatment modality in cancer. There is sparse knowledge on how patients with cancer experience their radiotherapy trajectory, and which factors might be associated with patients' experiences.

Objectives: The aim of the present study was to explore how adults with cancer receiving radiotherapy evaluate the quality of their care, utilizing a patient-reported experience measure, and how patient- and service-related characteristics are associated with their evaluation.

Methods: An explorative cross-sectional study using a self-completed questionnaire to assess patients' radiotherapy experiences was performed. Participants were recruited consecutively, within their last week of treatment, from two different hospitals in Norway from January 2021 to January 2022. Four hundred and eighty paper questionnaires were distributed to recruited patients, 240 at each hospital. Questionnaires were self-completed at home and returned by mail. The instrument person-centered coordinated care experience questionnaire (P3CEQ) was used. In addition to this, participants completed the European Organization of Research and Treatment of Cancer Quality of Life Questionnaire-C30 (EORTC QLQ-C30) and The Sense of Coherence 13 scale (SOC-13). Data were analyzed using descriptive statistics, parametric tests, and unadjusted/adjusted linear regression models were estimated.

Results: The study included 373 patients. Patients evaluated quality of care in terms of P3CEQ scores, with a mean score of 19.5 (standard deviation = 5.4). Lowest scores were identified in areas concerning person-centeredness and service coordination. There were no significant differences in P3CEQ scores between the younger and older groups. Having a partner and better SOC-13 scores were independently associated with the overall patient-reported experience score, whereas age was not.

Conclusion: Patient-reported experience scores indicate that improvements are needed in some areas, such as informing and involving patients in the planning and coordination of their care. Findings suggest paying special attention to patients without a partner to offer patients the best possible care.

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Introduction and Background

Radiotherapy (RT) is the main treatment modality in cancer, and is typically administered as daily treatments over several days or weeks, and with a curative or palliative intent (O'Donovan et al., 2017). As for other cancer treatments, there are side effects both during and after the treatment (Cleeland et al., 2012; Koinberg et al., 2018). Receiving radiotherapy is expected to cause multiple encounters with healthcare professionals (e.g., oncologists, general practitioners, radiotherapists, cancer nurses, home care nurses), at different levels of the healthcare service, which can cause inconsistencies in care (Nordsveen & Andershed, 2015). Nurses hold a prominent role in the treatment and follow-up of patients receiving radiotherapy, as they meet the patients in all parts of the radiotherapy trajectory (Bashkin et al., 2023).

As radiotherapy is mainly delivered as outpatient treatment (Rose, 2016), travel—or protracted hospital stays for those who are unable to travel due to health or transport limitations—is demanding. Radiotherapy is particularly strenuous for older patients who are more vulnerable and have more complex needs than their younger counterparts (O'Donovan et al., 2017). Overall, the treatment trajectory and health care needs of patients receiving radiotherapy are complex (Tremblay et al., 2015), and increasingly so due to an aging population and a rapidly increasing number of older patients. As older patients frequently suffer from co-existing ailments and diseases (Wildiers et al., 2014), optimizing quality of care is therefore crucial (Owusu & Berger, 2019).

According to a review describing preferences of care in patients with cancer, there is no single particular dimension of the cancer care trajectory considered insignificant by patients (Petersen et al., 2015). Reportedly, patients are also concerned about collaboration between different levels in the health care service (Lilleheie et al., 2019), and studies point out how they find it unclear where to raise questions or concerns when required (Lilleheie et al., 2020; Sollid et al., 2021). To identify areas of improvement (Nightingale et al., 2020; Rudolph et al., 2019), it is thus considered appropriate to focus on the entire radiotherapy trajectory (Egestad, 2013). However, this has rarely been done.

Review of Literature

High-quality healthcare comprises safety, effectiveness, timeliness, efficiency, equity, and patient-centeredness (Anhang Price et al., 2014; Institute of Medicine, 2001). According to others (Lloyd et al., 2019; Lloyd et al., 2018; Sugavanam et al., 2018), person-centered coordinated care comprises five core domains: information and communication, care planning, transitions, patient-defined goals or outcomes, and shared decision-making. Considering the complex healthcare needs of patients with cancer, patient-centeredness is warranted and acknowledged as an essential element of high-quality cancer care (Beattie et al., 2013; Langberg et al., 2019). Consequently, patients' experiences should determine the improvements to be made in health care delivery. Although patients with cancer have reported positive experiences with several services, including radiotherapy and follow-up (Tomlinson et al., 2014; Tremblay et al., 2015), radiotherapy services have been criticized for not being patient-centered, and utilizing patient experiences can be a means to improve care quality for patients receiving radiotherapy (Metsälä et al., 2022).

Patient-reported experience measures (PREMs) can be used to assess patients' experiences with their health care (Bastemeijer et al., 2019; Beattie et al., 2015; Schembri, 2015; Tremblay et al., 2015). Numerous instruments are available (Beattie et al., 2015; Bull et al., 2019; Male et al., 2017) and patient involvement in the development of such instruments is crucial to ensure inclusion of relevant aspects (Nilsson et al., 2016). By the use of appropriate PREMs, individual experience can be assessed systematically (Lloyd et al., 2018; Nilsson & Kristenson, 2017) and offer insight into aspects of care quality which only patients themselves can provide (Anhang Price et al., 2014). However, patients' perception of care and care quality is subjective and complex (Schembri, 2015), making measurement a challenging task (Nilsson & Kristenson, 2017). Multiple factors may affect patients' experiences. These include age, gender, marital status, educational level, treatment intent, expectations, previous experiences, hospital size, and how information is delivered and perceived (Danielsen et al., 2007; Guldhav et al., 2017; Nilsson & Kristenson, 2017; Rose, 2016; Sollid et al., 2021). A previous Norwegian study found that sense of coherence was significantly lower in patients who experienced care quality as low, compared to patients who perceived high care quality (Sandsdalen et al., 2019). Additionally, patients' experiences with patient-centeredness may be influenced by whether a hospital has academic affiliation or is a local hospital (Tremblay et al., 2015), and a previous study has found patients' experiences to differ based on service organization (Ansmann et al., 2014). Further, quality of life (QoL) and symptom burden are reportedly associated with how patients perceive their care (Christiansen et al., 2022), where more symptoms cause a poorer experience.

Purpose and Aim

The purpose of this study was to acquire knowledge about patients' experiences from the entire radiotherapy trajectory, as well as an understanding of factors affecting patients' experiences in this setting. This is necessary for the improvement of radiotherapy services. The aim of the present study was to explore how adults with cancer receiving radiotherapy evaluate the quality of their care, utilizing a patient-reported experience measure, and how patient- and service-related characteristics are associated with their evaluation.

Methods

Design

To survey how patients experience their radiotherapy trajectory, an explorative cross-sectional study at the end of patients' radiotherapy treatment was conducted. A self-administered questionnaire to survey patients' experiences was utilized.

Research Questions

In this study, the research questions were:

(I) How do adult patients with cancer receiving radiotherapy experience their overall care?
(II) Do older patients perceive services differently than younger patients?
(III) How are patient- and service-related factors associated with patients' experiences of care during radiotherapy?

Study Setting

The study was conducted at two different hospitals in Norway: a local hospital and a university hospital, both providing radiotherapy. There is some variation in the hospitals' patient volume, organization, and routines. The radiotherapy unit at the university hospital treats about 1200 patients per year and provides all radiotherapy services to inhabitants in its catchment area. The local hospital treats about 700 patients per year and provides palliative radiotherapy irrespective of cancer type, and curative radiotherapy to selected diagnoses, including breast and prostate cancer. Further details describing the two different hospitals where the study was conducted are presented in another publication by Røyset et al. (2021).

Inclusion and Exclusion Criteria

This study's *inclusion criteria* comprised patients with a confirmed cancer diagnosis, aged ≥ 18, and receiving radiotherapy with palliative or curative intent. All radiotherapy schedules and prescribed total doses were eligible for inclusion. Patients provided written, informed consent, and had to be fluent in Norwegian and capable of filling in a self-report questionnaire. The *exclusion criteria* were being too fragile or ill to participate, as evaluated by an oncologist.

Data Collection and Recruitment

Recruitment was done within patients' last week of treatment, so their answers would cover their entire radiotherapy trajectory. Data collection was conducted between January 2021 and January 2022. Four hundred and eighty questionnaires were distributed, 240 at each hospital. Only consenting participants received a set of questionnaires (see descriptions below), to be self-completed at home and returned in a pre-paid envelope. The questionnaires addressed patients' *overall experience* of care received from radiotherapy referral until the end of treatment. In addition, participants reported age, gender, marital status, highest attained educational level, and living arrangements. Patients who did not return the questionnaires within 3 weeks, received one reminder. Project staff at each hospital collected data from medical records. These data comprised cancer diagnosis, number of treatment fractions, treatment intent (palliative or curative), and if patients had previously received radiotherapy.

Data Collection Questionnaires. The study made use of three different questionnaires: the Person-centered coordinated care experience questionnaire (P3CEQ), the European Organization for Research and Treatment of Cancer Core Quality-of-Life Questionnaire (QLQ-C30), and the Sense of coherence-13 scale (SOC-13).

Person-Centered Coordinated Care Experience Questionnaire (P3CEQ). To assess patients' experience the authors used a translated Norwegian version of the P3CEQ (Lloyd et al., 2019). There is no current gold standard for PREMs (Beattie et al., 2015), and although there are other generic measures available (Danielsen et al., 2007), the P3CEQ has recently been validated for patients receiving radiotherapy (Robinson, 2018; Sollid et al., 2022). The instrument seems to capture the variation in patients' experiences (Lloyd et al., 2019; Sollid et al., 2022) and thereby allows for differentiation between experiences reported from a complex care trajectory. Furthermore, the instrument focuses on person-centered care, transitions, decision-making, information, and communication (Lloyd et al., 2019; Sugavanam et al., 2018), which are all highly relevant areas for patients with cancer, and the subscales can help identify potential areas for improvement in service delivery, including in a radiotherapy setting. Three factors were identified in the Norwegian validation process: *Person-centeredness*, *service coordination*, and *support* (Sollid et al., 2022). These factors can provide insight into different areas of patients' experiences of radiotherapy. There is, however, no established cut-off for the P3CEQ to define poor or high quality of care. In line with the development of the questionnaire (Lloyd et al., 2019), the authors have interpreted the findings in the current study as higher scores indicating better care, which is also confirmed by others employing the P3CEQ (Rijken et al., 2022), reporting P3CEQ scores to be positively correlated with quality ratings of patients' total care.

The instrument comprises 10 items. Likert scoring (Allen & Seaman, 2007) from 0 to 3 is applied for eight items (Lloyd et al., 2019). Item 6 (Single named contact/coordinator) and 7a (Care plan) are scored dichotomously, as either 0 or 3. Item 7a triggers responses to items 7b–d, all of which concern care plans. Appropriate, explanatory text for each

item's scoring option is provided in the questionnaire. The response "not relevant" gives a score of 0 for all items.

A total score for the P3CEQ scale is found by summing all items and ranges from 0 to 30, with higher scores indicating higher levels of person-centered coordinated care (Lloyd et al., 2019). For subscales, all subscale items are also summed. *Person-centered scale* ranges from 0 to 9, *service coordination* ranges from 0 to 6, and *support* ranges from 0 to 15.

European Organization for Research and Treatment of Cancer Core Quality-of-Life Questionnaire (QLQ-C30). To assess patients' global health/QoL, functioning, and symptoms, the authors used the QLQ-C30, which is a cancer-specific, psychometrically robust, and widely used quality of life instrument (Aaronson et al., 1993). QLQ-C30 comprises 30 items, distributed across 5 functioning scales (physical, role, cognitive, emotional, and social functioning), 9 symptom scales/items (fatigue, nausea and vomiting, pain, dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties) and a global health/QoL scale. All items are scored from 1 (not at all) to 4 (very much), except for global QoL which is scored from 1 (very poor) to 7 (excellent). All scales and single items are transformed to scores ranging from 0 to 100. Higher scores on the functional and global health/QoL scales show better functioning and global health/QoL, and higher scores on symptom scales show more symptoms (Fayers et al., 2001; Aaronson et al., 1993). A difference of 10 points is regarded as clinically significant (Osoba et al., 1998).

Sense of Coherence-13 Scale (SOC-13). The sense of coherence (orientation to life scale) comprises the three domains comprehensibility, manageability, and meaningfulness, and includes 13 items. All items are scored on a 7-point Likert scale, ranging from 1 to 7, with appropriate text anchors. The total score ranges from 13 to 91 points, where higher scores indicate a higher sense of coherence. The SOC-13 is a validated instrument, and suitable for self-administration (Antonovsky, 1993; Eriksson & Lindström, 2005; Pallant & Lae, 2002).

Statistical Analysis

Patient characteristics, service-related factors, P3CEQ scores, QLQ-C30 scores, and SOC-13 scores are presented for the total sample. Additionally, the authors present data separated into two groups: younger patients (aged ≤64) versus older patients (aged ≥65). A cut-off at age 65 between younger and older adults is considered appropriate and well-used in current research (Eriksen et al., 2022; Røyset et al., 2021; United Nations Office of the High Commissioner for Human Rights, 2023; Zhang et al., 2023). Categorical data are described with frequencies and percentages, and continuous data with means and standard deviations (SD). The authors have used parametric tests, as the number of

participants is considered to be sufficiently high, that is, the authors consider that the central limit theorem applies with N > 50 (Polit & Beck, 2017; Rosner, 2017). Comparisons between age groups were made using Pearson's χ^2 and individual samples t-test, as appropriate.

The authors explored the association between P3CEQ total scores and factors assumed to affect patients' experience by estimating unadjusted linear regression models. Explored factors were age, gender, living arrangements, marital status, education level, treatment intent (palliative vs. curative), length of treatment (i.e., number of RT fractions), hospital site (local or university hospital), sense of coherence (i.e., SOC-13 scores), and patients' function and symptom burden (i.e., all QLQ-C30 scales). Thereafter, an adjusted linear regression model was estimated to identify factors independently associated with P3CEQ scores. Due to the explorative nature of this analysis, the authors chose to include all potentially influencing factors in the model, except for living arrangement, which showed collinearity with marital status. Next, corresponding unadjusted and adjusted models to explore the association between aforementioned factors and P3CEQ *subscales* were estimated.

Missing values in QLQ-C30 items were handled according to guidelines (Fayers et al., 2001). The authors imputed SOC-13 and P3CEQ scores if there were ≤3 values missing to the total scales. Imputed values were calculated by averaging the scores of the other respondents to the topical item (mean substitution) (Polit & Beck, 2017). If participants had ≥4 missing values, no imputation was made, and the cases were excluded. For the P3CEQ scale, missing scores in item 7a were replaced with "0" as patients were assumed to "Don't know" if they had a care plan.

All tests were two-sided and results with p-values below 0.05 were considered statistically significant. Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp.

Results

Response Rate and Sample Size

Out of 480 questionnaires distributed to consenting participants, 381 patients returned their responses. Out of these, eight questionnaires had extended amounts of missing data (i.e., whole pages missing) and were excluded, hence 373/480 (77.7%) patients were included in the analysis.

Patient Characteristics

In the total sample (N = 373), age ranged between 29 and 91 years (mean [SD] age 65.8 [11.0] years). As shown in Table 1, 203 (54.4%) participants were female, 278 (74.5%) were married or had a partner, and 86 (23.1%) lived alone. Secondary education was the most frequent educational level (43.3%). Most participants received curative treatment (79.6%), and most had not previously received

Table 1. Patient Demographic and Clinical Characteristics (N = 373).

Characteristics (N = 373)	All participants N (%)	Aged ≤64 n (%)	Aged ≥65 n (%)	p-value* χ2
Gender				
Female	203 (54.4)	112 (72.3)	91 (41.7)	
Male	170 (45.6)	43 (27.7)	127 (58.3)	**<0.001**
Marital status				
Single	95 (25.5)	35 (22.6)	60 (27.5)	
Married/partner	278 (74.5)	120 (77.4)	158 (72.5)	0.280
Living arrangements				
Alone	86 (23.1)	25 (16.1)	61 (28.0)	
With others	287 (76.9)	130 (83.9)	157 (72.0)	**0.007**
Education level[a]				
Primary	72 (19.7)	8 (5.3)	64 (30.0)	
Secondary	158 (43.3)	72 (47.4)	86 (40.4)	
College or University	135 (37.0)	72 (47.4)	63 (29.6)	**<0.001**
RT fractions				
1–9				
10–15	47 (12.6)	13 (8.4)	34 (15.6)	
16–29	152 (40.8)	78 (50.3)	74 (33.9)	
≥30	77 (20.6)	25 (16.1)	52 (23.9)	
	97 (26.0)	39 (25.2)	58 (26.6)	**0.006**
Previously received RT				
Yes	61 (16.4)	17 (11.0)	44 (20.2)	
No	312 (83.6)	138 (89.0)	174 (79.8)	**0.018**
Treatment intent				
Curative	297 (79.6)	132 (85.2)	165 (75.7)	
Palliative	76 (20.4)	23 (14.8)	53 (24.3)	**0.025**
Hospital site				
Local	189 (50.7)	72 (46.5)	117 (53.7)	
University	184 (49.3)	83 (53.5)	101 (46.3)	0.169

The significance for boldface to highlight statistical significance.
[a]Total n differs due to 8 missing values. n = 365.
*All tests performed were chi-square tests.

radiotherapy (83.6%). The most frequent types of cancer were breast (n = 150 [40.2%]), followed by prostate (n = 111 [29.8%]), lung (n = 34 [9.1%]), and other cancers (n = 78 [21.2%]).

A total of 155 (42%) participants could be classified as younger (≤64 years) (mean [SD] age 55.2 [7.6] years), whereas 218 (58.0%) were older (≥65 years) (mean [SD] age 73.4 [5.3] years) (p < 0.001). Between these groups several characteristics differed significantly: the older group had fewer women, and a larger proportion of participants living alone and having completed primary school only. Furthermore, more participants in the older group received palliative treatment, and had experience from previous radiotherapy (see Table 1 for further details).

Research Question Results

P3CEQ Scores. Patients' experienced quality of care, measured by the P3CEQ, is displayed in Table 2. The total P3CEQ score for the full sample ranged from the lowest score of 6 to the highest score of 30, mean 19.5 (SD 5.4). In the younger group, the mean score (SD) was 19.9 (4.9), in the older group, it was 19.3 (5.8) (p = 0.303).

There was a tendency toward older participants reporting poorer scores on several items, compared to younger participants. However, the only statistically significant difference between younger and older patients, was scores on item 9 ("information to self-manage"), where older patients reported a poorer experience than the younger patients (2.2 vs. 2.4, p = 0.010). In the full sample, the subscales *person-centeredness* and *service coordination* had the lowest scores throughout, whereas for the *support* subscale, items had scores of 2.3 or higher. For an overview of scores, see Table 2.

QLQ-C30 and SOC-13 Scores. Mean scores and (SD) for QLQ-C30 and SOC-13 are displayed in Table 3. As few items were missing in both questionnaires, scale and summary scores could be estimated for all patients, except for a few cases (Table 3).

Table 2. Means Scores (SD) from the P3CEQ Total Score, Subscales and Item Scores, and a Comparison of Scores Between Participants Aged Under and Over 65.

Scales, subscales, and items*	All participants N = 373	Aged ≤64 n = 155	Aged ≥65 n = 218	p-value T-test
Total P3CEQ score	19.5 (5.4)	19.9 (4.9)	19.3 (5.8)	0.303
Person-centeredness				
1. Discuss what's important to you	1.3 (1.0)	1.2 (1.0)	1.3 (1.0)	0.828
2. Involved in decisions	1.7 (1.1)	1.8 (1.1)	1.7 (1.1)	0.666
3. Considered "whole person"	2.1 (1.1)	2.2 (1.1)	2.0 (1.1)	0.195
Subscale total (0–9)**	5.1 (2.6)	5.2 (2.5)	5.0 (2.6)	0.508
Service coordination				
6. Single named contact/coordinator	1.4 (1.5)	1.3 (1.5)	1.5 (1.5)	0.440
7. Care planning	0.8 (1.2)	0.8 (1.2)	0.7 (1.2)	0.680
Subscale total (0–6)**	2.2 (2.2)	2.1 (2.3)	2.2 (2.2)	0.770
Support				
4. Patients compelled to repeat information	2.5 (0.9)	2.5 (0.9)	2.5 (0.9)	0.864
5. Care joined up	2.3 (1.0)	2.3 (1.0)	2.3 (1.0)	0.772
8. Support to self-manage	2.7 (0.8)	2.7 (0.6)	2.7 (0.8)	0.537
9. Information to self-manage	2.3 (0.9)	2.4 (0.8)	2.2 (1.0)	**0.010**
10. Confidence to self-manage	2.5 (0.7)	2.6 (0.7)	2.4 (0.8)	0.085
Subscale total (0–15)**	12.3 (2.6)	12.5 (2.3)	12.1 (2.8)	0.081

The significance for boldface to highlight statistical significance.
*All items scored 0–3.
**Min − max value for subscale.

Table 3. Presentation of Patients' Global Health/QoL, Function, Symptom Burden, and SOC, and a Comparison of Mean Scores in QLQ-C30 and SOC-13 Between Younger and Older Participants.

Variables	All participants Mean (SD)	N	Aged ≤64 Mean (SD)	N	Aged ≥65 Mean (SD)	N	p-value T-test
QLQ-C30							
Global health/QoL[a]	62.7 (24.0)	370	58.0 (24.2)	155	66.0 (23.4)	215	**0.001**
Functional scales[a]							
Physical	77.1 (22.8)	373	78.0 (22.5)	155	76.5 (23.1)	218	0.533
Role	62.6 (32.6)	373	54.6 (32.5)	155	68.3 (31.5)	218	**<0.001**
Emotional	82.2 (20.4)	371	77.8 (21.2)	155	85.3 (19.3)	216	**<0.001**
Cognitive	80.0 (22.0)	371	73.9 (25.1)	155	84.3 (18.3)	216	**<0.001**
Social	68.3 (29.3)	371	59.8 (30.3)	155	74.4 (27.0)	216	**<0.001**
Symptom scales[b]							
Fatigue	44.8 (26.9)	373	49.5 (27.9)	155	41.4 (25.7)	218	**0.004**
Nausea/vomiting	7.4 (13.8)	372	8.8 (15.5)	155	6.4 (12.5)	217	0.105
Pain	26.8 (29.9)	371	31.3 (30.5)	154	23.6 (29.1)	217	**0.014**
Single items[b]							
Dyspnea	24.3 (29.2)	373	23.4 (29.0)	155	24.9 (29.4)	218	0.630
Insomnia	33.0 (31.3)	373	37.2 (31.8)	155	30.0 (30.7)	218	**0.028**
Appetite loss	18.9 (28.8)	373	19.4 (28.9)	155	18.5 (28.8)	218	0.778
Constipation	23.3 (29.9)	369	21.9 (30.0)	155	24.3 (29.8)	214	0.454
Diarrhea	24.8 (28.8)	366	21.0 (27.2)	154	27.5 (29.6)	212	**0.032**
Financial difficulties	8.1 (19.9)	371	13.5 (25.1)	155	4.2 (13.9)	216	**<0.001**
SOC-13[c]							
Total score	72.4 (11.7)	368	70.3 (11.7)	152	74.0 (11.4)	216	**0.003**

The significance for boldface to highlight statistical significance.
[a]A high score indicates a high QoL or a higher degree of functioning.
[b]A higher score indicates more symptoms.
[c]A higher score indicates a higher sense of coherence.

Table 4. Results of Unadjusted and Adjusted Linear Regression Models Estimating the Association Between Total P3CEQ-Score (Dependent) and Patient- and Service-Related Characteristics.

Independent variables	Unadjusted (p-value)	CI (95%)	Adjusted (p-value)	CI (95%)
Age (≥65)	−0.571 (0.316)	[−1.689; 0.547]	0.088 (0.902)	[−1.325; 1.501]
Gender (female)	−0.026 (0.963)	[−1.134; 1.081]	0.311 (0.680)	[−1.167; 1.788]
Living arrangement (with others)	1.297 (**0.051**)	[−0.007; 2.600]	-	-
Marital status (married/partner)	1.386 (**0.031**)	[0.127; 2.644]	1.478 (**0.034**)	[0.112; 2.843]
Education level Ref compulsory				
Secondary	0.594 (0.440)	[−0.915; 2.102]	0.274 (0.745)	[−1.386; 1.934]
University	1.195 (0.130)	[−0.353; 2.743]	0.048 (0.956)	[−1.683; 1.779]
SOC-13	0.088 (**<0.001**)	[0.041; 0.135]	0.062 (**0.053**)	[−0.001; 0.124]
Global health/QoL	0.030 (**0.010**)	[0.007; 0.053]	0.026 (0.256)	[−0.019; 0.072]
Physical	0.036 (**0.003**)	[0.013; 0.060]	0.029 (0.165)	[−0.012; 0.070]
Role	0.012 (0.170)	[−0.005; 0.029]	−0.009 (0.571)	[−0.042; 0.023]
Emotional	0.036 (**0.008**)	[0.010; 0.063]	0.015 (0.460)	[−0.025; 0.054]
Cognitive	0.021 (0.103)	[−0.004; 0.046]	0.004 (0.837)	[−0.031; 0.038]
Social	0.006 (0.550)	[−0.013; 0.025]	−0.017 (0.259)	[−0.046; 0.012]
Fatigue	−0.017 (0.113)	[−0.037; 0.004]	0.022 (0.295)	[−0.020; 0.064]
Nausea/vomiting	−0.044 (**0.029**)	[−0.084; −0.005]	−0.018 (0.493)	[−0.071; 0.034]
Pain	−0.018 (0.056)	[−0.036; 0.000]	0.014 (0.316)	[−0.014; 0.042]
Dyspnea	−0.027 (**0.006**)	[−0.045; −0.008]	−0.018 (0.158)	[−0.042; 0.007]
Insomnia	−0.020 (**0.029**)	[−0.037; −0.002]	−0.012 (0.256)	[−0.033; 0.009]
Appetite loss	−0.019 (**0.046**)	[−0.039; 0.000]	0.004 (0.744)	[−0.022; 0.031]
Constipation	−0.022 (**0.020**)	[−0.040; −0.003]	−0.009 (0.431)	[−0.031; 0.013]
Diarrhea	−0.004 (0.705)	[−0.023; 0.016]	0.009 (0.444)	[−0.014; 0.032]
Financial difficulties	−0.004 (0.804)	[−0.031; 0.024]	0.014 (0.378)	[−0.018; 0.046]
RT fractions ref 1–9				
10–15	1.145 (0.206)	[−0.632; 2.922]	1.063 (0.327)	[−1.068; 3.195]
16–29	0.452 (0.653)	[−1.519; 2.423]	0.290 (0.813)	[−2.122; 2.703]
≥30	1.272 (0.187)	[−0.620; 3.164]	0.714 (0.551)	[−1.641; 3.068]
Previous RT (yes)	−1.157 (0.127)	[−2.644; 0.330]	−0.782 (0.372)	[−2.502; 0.938]
Treatment intent (curative)	0.023 (0.974)	[−1.347; 1.392]	−1.251 (0.159)	[−2.995; 0.494]
Hospital site (university)	0.694 (0.216)	[−0.408; 1.795]	0.689 (0.259)	[−0.509; 1.887]
R^2(adjusted)	-			0.027

The significance for boldface to highlight statistical significance.

Ten QLQ-C30 functioning and symptoms scales showed a statistically significant difference between younger and older patients, most favoring the older group (Table 3). Among these, a clinically significant difference (i.e., minimum 10-point difference) was found only for role functioning (54.6 vs. 68.3, $p < 0.001$), cognitive functioning (73.9 vs. 84.3, $p < 0.001$), and social functioning (59.8 vs. 74.4, $p < 0.001$).

The SOC-13 scores also differed significantly between older and younger patients (70.3 vs. 74.0, $p = 0.003$) with a poorer score in the younger group (Table 3).

Regression Models—Factors Associated with P3CEQ Scores.
According to the unadjusted regression models, living with others and being married/having a partner were significantly and positively associated with the *P3CEQ total score* (see Table 4). Higher SOC-13 scores and higher scores for global health/QoL, physical function, and emotional function also showed a statistically significant association with higher P3CEQ scores. Variables with a statistically significant, negative association with P3CEQ scores were nausea/vomiting, dyspnea, insomnia, appetite loss, and constipation. No other significant associations were found.

In the adjusted model, marital status (married/partner) and SOC-13 scores were the only factors that remained significantly associated with patients' total P3CEQ scores (living with others was excluded in the model due to collinearity with marital status).

The adjusted model explained 2.7% of the variation in the total P3CEQ score. Details are displayed in Table 4.

Table 5. Results of Unadjusted and Adjusted Linear Regression Models Estimating the Association Between P3CEQ Subscale Support Score (Dependent) and Patient- and Service-Related Characteristics.

	Unadjusted	Ci 95%	Adjusted	Ci 95%
Age (≥65)	−0.461 (0.092)	[−0.999; 0.076]	−0.132 (0.672)	[−0.745; 0.481]
Gender (female)	0.482 (0.075)	[−0.050; 1.014]	0.940 (**0.004**)	[0.299; 1.581]
Living arrangement (with others)	0.538 (0.094)	[−0.092; 1.167]	-	-
Marital status (married/partner)	0.373 (0.229)	[−0.236; 0.982]	0.665 (**0.028**)	[0.072; 1.258]
Education level				
Ref compulsory				
Secondary	0.494 (0.178)	[−0.226; 1.214]	0.294 (0.423)	[−0.427; 1.014]
University	0.566 (0.133)	[−0.173; 1.304]	−0.218 (0.568)	[−0.969; 0.533]
SOC-13	0.058 (**<0.001**)	[0.036; 0.080]	0.023 (0.090)	[−0.004; 0.051]
Global health/QoL	0.033 (**<0.001**)	[0.023; 0.044]	0.010 (0.331)	[−0.010; 0.030]
Physical	0.039 (**<0.001**)	[0.028; 0.050]	0.031 (**<0.001**)	[0.013; 0.049]
Role	0.020 (**<0.001**)	[0.012; 0.028]	−0.007 (0.331)	[−0.021; 0.007]
Emotional	0.035 (**<0.001**)	[0.023; 0.048]	0.014 (0.108)	[−0.003; 0.031]
Cognitive	0.017 (**0.006**)	[0.005; 0.029]	−0.009 (0.259)	[−0.023; 0.006]
Social	0.019 (**<0.001**)	[0.010; 0.028]	0.003 (0.648)	[−0.010; 0.016]
Fatigue	−0.024 (**<0.001**)	[−0.034; −0.015]	0.006 (0.489)	[−0.012; 0.025]
Nausea/vomiting	−0.046 (**<0.001**)	[−0.065; −0.027]	−0.014 (0.228)	[−0.037; 0.009]
Pain	−0.024 (**<0.001**)	[−0.032; −0.015]	0.002 (0.783)	[−0.010; 0.014]
Dyspnea	−0.020 (**<0.001**)	[−0.028; −0.011]	−0.003 (0.623)	[−0.013; 0.008]
Insomnia	−0.018 (**<0.001**)	[−0.026; −0.009]	−0.005 (0.309)	[−0.014; 0.004]
Appetite loss	−0.025 (**<0.001**)	[−0.034; −0.017]	−0.009 (0.140)	[−0.020; 0.003]
Constipation	−0.017 (**<0.001**)	[−0.025; −0.008]	0.002 (0.755)	[−0.008; 0.011]
Diarrhea	−0.005 (0.289)	[−0.014; 0.004]	0.011 (**0.037**)	[0.001; 0.020]
Financial impact	−0.011 (0.116)	[−0.024; 0.003]	0.004 (0.597)	[−0.010; 0.018]
RT fractions				
Ref 1–9				
10–15	0.978 (**0.025**)	[0.125; 1.831]	0.633 (0.179)	[−0.292; 1.558]
16–29	0.484 (0.315)	[−0.463; 1.430]	0.212 (0.690)	[−0.835; 1.259]
≥30	0.665 (0.151)	[−0.243; 1.574]	0.249 (0.632)	[−0.773; 1.271]
Previous RT (yes)	−0.959 (**0.008**)	[−1.671; −0.246]	−0.508 (0.182)	[−1.254; 0.239]
Treatment intent (curative)	0.271 (0.419)	[−0.389; 0.931]	−0.730 (0.059)	[−1.487; 0.027]
Hospital site (university)	0.100 (0.711)	[−0.432; 0.632]	0.270 (0.308)	[−0.250; 0.790]
R²(adjusted)	-			0.168

The adjusted model exploring the association between the *Person-centeredness* subscale and the potentially influencing factors, revealed no significant association with any factor, and the model explained only 1.9% of the variation in the *person-centeredness score*. For the subscale *Service coordination*, the adjusted model showed a positive, statistically significant association with marital status (B = 0.712, [p = 0.015], CI: 0.141; 1.282). Only 1.8% of the variation in the *Service coordination* subscale *score* was explained by the variables in the model. Further details on these models can be found in Supplemental Table 1.

For the *Support* subscale, the authors found a different pattern from the aforementioned models. In the adjusted model, gender, marital status, physical function, and diarrhea were positively associated with subscale scores (Table 5), and the model explains 16.8% of the variation in the subscale scores.

Discussion

The main findings of this study show that although patients seemingly have a positive experience of their care, as measured by the P3CEQ, there is potential for improvement in *person-centeredness* and *service coordination*. Age is not associated with patients' experience of care. Being married/partner and having a stronger sense of coherence are the only factors associated with patients' experience of care (i.e., P3CEQ total score).

The P3CEQ subscale *service coordination* had the lowest mean item subscale score in this study (1.1 vs. 1.7 in person-centeredness and 2.5 in support). In line with the findings of others (de Bruin et al., 2018), this indicates that patients could be more involved in setting goals and care planning. Service coordination and collaboration between service levels and sectors are recognized challenges in Norwegian health care (Johansen & Ervik, 2022). Improving service

coordination and collaboration could be a way to give patients a better experience of services. However, the nature of radiotherapy services, characterized by outpatient treatment over an extended period and involvement of several health care professionals, makes seamless organization a steep challenge. Ensuring that all patients have a named care coordinator and know who they are and how to contact them, could be a step in the right direction. A large number of participants in this study are seemingly unaware of their care coordinator's contact information/existence, as they report low scores in the item concerning a coordinator.

The authors found only minor differences between younger and older patients when comparing P3CEQ item scores, and age was not associated with P3CEQ scores in either unadjusted or adjusted models. Opposed to the findings in this study, a previous study from the radiotherapy setting has shown that age may affect patients' experience (Danielsen et al., 2007). According to recent findings, the impact of demographic characteristics on patients' ratings of health care quality may differ across groups, and might even be absent (de Boer et al., 2017). In this study, the authors consider the indistinguishable difference in P3CEQ scores between younger and older patients to underline that the need for individual adjustments (i.e., person-centeredness) is of greater importance in care delivery.

According to the findings in this study, the main factors influencing patients' experience of care seemed to be sense of coherence and marital status, that is, among the factors investigated. An association between a higher sense of coherence and better scores of care quality has been established in former studies (Larsson & Larsson, 1999; Sandsdalen et al., 2019). As a construct, a sense of coherence is considered a general life orientation (Antonovsky, 1993), and it appears that a positive life orientation may positively affect the experience of health care quality. Marital status was found to be independently associated with the overall P3CEQ scores as well as with the *service coordination-* and *support* subscales, and may thus be the overall most important factor. Others have found that being married may also improve other outcomes in cancer, and this may assumedly come from the substantial significance of having someone for support (Aizer et al., 2013). As this study identified a significant association between SOC-13 and the total P3CEQ scores, non-appraisable factors such as patients' individual preferences, goals, and coping strategies might be the major factors influencing patients' experience. In turn, this points to the importance of patient-centeredness and the need for individually tailored care.

Although patients with cancer have reported positive experiences with care services, including radiotherapy and follow-up, and both nurses and patients have reported moderate to high levels of individualized care (Tomlinson et al., 2014; Tremblay et al., 2015), radiotherapy services have been criticized for not being patient-centered, warranting utilization of users' experience for optimization (Freeman et al., 2012). The Norwegian health care service

has prescribed a patient-centered approach, but fully incorporating patients' areas of importance in their care planning (Helse- og omsorgsdepartementet, 2017; Olsen et al., 2020) still poses a challenge. This is in line with this study's findings, also indicating a need for further "person-centering" of services, to ensure patients are seen as individuals rather than just faces in a crowd.

In this study, ratings on the *support* subscale were also negatively associated with being male, having poorer physical function and more symptoms in terms of diarrhea. The latter is in line with a previous study showing that higher symptom burden was associated with lower perceptions of information quality (Christiansen et al., 2022). Otherwise, the authors are not aware of any studies for direct comparison. However, physical limitations clearly increase the need for support. Furthermore, men might have a more pronounced need for social support, particularly divorced/separated men (Krajc et al., 2023). In summary, the findings of this study indicate that to improve care quality, increased attention should be given to patients who are single and/or living alone, men in particular, and to those having poorer physical function or distressing symptoms. It should be noted that the variation in patients' ratings was only partly explained by this study's adjusted regression models. This could mean that several unknown factors may be of more substantial importance than those investigated. However, this can also be understood as the fact that P3CEQ is a PREM (Lloyd et al., 2019), and thus assesses what it is intended to: *patients' evaluation of care* (Ahmed et al., 2014; Wolf et al., 2014).

Strengths and Limitations

A strength of this study is the high response rate. The authors also consider the choice of questionnaire (i.e., P3CEQ) a strength. Further, the authors recognize that PREMs are measurements of the care process. This may imply that such measures are better for measuring changes or improvement initiatives in the care process (Shunmuga Sundaram et al., 2022). As this is a cross-sectional study, without longitudinal measurement, this study is not able to describe changes in care experiences.

This study has several limitations. First, the study has a heterogeneous group of patients in terms of cancer type, stage, and radiotherapy regimen. This clearly increases the complexity of reported experiences, and the overall diversity may prevent the identification of factors that are important for the experience of specific subgroups. Second, the authors have deficient and no information about the study non-responders and those who declined participation, respectively. This obstructs evaluation of the sample's representativeness and a non-response analysis. Third, the authors' approach for substituting missing items might be imprecise as mean substitution was used (Polit & Beck, 2017), a method that may reduce variance (Allison, 2001). However, there are few imputed values, and the authors thus consider that the chosen method does not bias

the study's results. Finally, this study is explorative and multiple factors that may affect patients' experience were tested. These factors were chosen based on previous reports and clinical judgment and collinearity was tested for. One frequently cited rule of thumb suggests at least 10 cases for each explanatory variable in the regression model (Austin & Steyerberg, 2015), while others suggest even fewer (Austin & Steyerberg, 2015). With 373 participants, the authors consider this study's sample sufficient to allow all chosen factors to be included. However, in summary, the explorative study design calls for caution in the interpretation of results. Despite the mentioned weaknesses, the used questionnaire (P3CEQ) covered the areas of importance to patients receiving radiotherapy, as identified in a previous qualitative study (Sollid et al., 2021). Both international and Norwegian testing shows good psychometric properties in the questionnaire (Lloyd et al., 2019; Rijken et al., 2022; Sollid et al., 2022). Thus, the authors argue that the results are both valid and reliable. However, these data are collected within a Norwegian context, but can probably be generalized to countries with similar health care systems, but not to considerably different health care systems.

Conclusions

This study shows that patients have an overall positive experience of their radiotherapy trajectory. However, identified areas of improvement were *person-centeredness* and *service coordination*. This indicates that patients' individual needs and preferences are not sufficiently incorporated in care delivery. Age had no impact on how patients experienced their care, whereas having a spouse/partner and a stronger sense of coherence were associated with a more positive experience.

Implications for Practice

PREM data can be used to improve the quality of health care services in areas identified by patients (Shunmuga Sundaram et al., 2022). In this study, identified areas of improvement are person-centeredness and service coordination. The findings from this study suggest that improving person-centered care for patients with cancer can imply that patients who are single and have a lower sense of coherence may be more vulnerable. Further implications may involve that health care professionals pay special attention to these patients to offer them the best possible care. The findings also indicate a need for assisting patients in service coordination. Health care administrators can facilitate the assigning of a single named contact or coordinator, who can assist patients in navigating the complex health care system.

Ethics Approval and Consent to Participate

The study was approved by the data protection officer at Innlandet Hospital Trust, Norway (ref 13276701). The study was reported to the Regional Ethics Committee South-East Norway (ref. 261211). The study was performed in accordance with the Declaration of Helsinki. All participants provided written, informed consent to participate in the study.

Approval to use the P3CEQ was obtained 08.09.2020, the EORTC QLQ-C30 (Request ID: 69799) 24.08.2020, and SOC-13 at STARS Society 24.08.2020.

Conducting research among severely ill persons calls for particular ethical considerations. Self-completion of the questionnaires at home, on participants' own schedule was chosen to ease any possible strain, as well as considerations of instruments' length and short versions whenever possible.

Authors' Contributions

MIVS contributed to data collection, formal analysis, writing-original draft, and writing-review and editing. MS contributed to conceptualization, funding acquisition, interpretation of data, and review and editing. SD contributed to interpretation of data and review and editing. GE contributed to interpretation of data and review and editing. ØK contributed to formal analysis, interpretation of data, review and editing, and supervision. All authors read and approved the final manuscript.

Consent for Publication

All participants were provided with verbal and written information outlining the project. Written and informed consents were obtained from participants before distributing questionnaires. Confidentiality was guaranteed. Participants independently completed and returned questionnaires.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to privacy concerns, but are available from the corresponding author on reasonable request.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Supplemental Material

Supplemental material for this article is available online.

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