Original Article

The Effect of Web-Based Education on Symptom Management and Quality of Life of Patients with Lung Cancer

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Abstract

Background: Patients with lung cancer frequently suffer from the symptoms such as cough, pain, dyspnea, fatigue, hemoptysis, sleep disturbances, nausea, and loss of appetite. In this digitalized age, web-based patient education is crucial to improve symptom management and quality of life in patients with lung cancer.

Objective: This study was carried out to investigate the effect of web-based education on symptom management and quality of life in patients with lung cancer.

Methodology: The quasi-experimental study was conducted with a repeated measures design. Personal Information Form, The Modified Borg Dyspnea Scale, The Lung Cancer Symptom Scale, EORTC QLQ C-30 Quality of Life Scale and LC-13 Lung Module were used for data collection. Patients were assessed at 4 time points: baseline assessment (T0), and then 2, 6, and 12 weeks (T1, T2, and T3) after participating in the study.

Results: It was determined that while the mean score of fatigue and insomnia had a tendency to decrease, the mean score of social function and nausea had a tendency to increase and a significant difference was found between the measurements (p<.05). In the analysis of the LC-13, it was found a significant difference between the mean score of dyspnea, and alopecia measurements (p<.05). No significant difference was found between the mean scores of measurements of the MBS, and the LCSS (p>.05). Global quality of life mean score tended to decrease, however no significant difference was found between the measurements (p>.05).

Conclusions: The findings indicate that the web-based patient education program is effective to reduce symptoms that the patients with lung cancer experience mostly and to increase their quality of life.

Keywords: Oncology Nursing, Lung Neoplasms, Patient Education, Symptom Management, Quality of Life

Introduction

Lung cancer has remained the leading cause of cancer death. According to the 2020 GLOBOCAN estimates, while cancer ranks third for incidence and second for mortality in women, it is the leading cause of morbidity and mortality in men (Sung et al., 2021). Patients with lung cancer experience intense symptoms depending on the disease and treatment methods such as chemotherapy, radiotherapy, surgery and immunotherapy (Kirkhus et al., 2019, Yang et al., 2016). According to the study results conducted by Bircan et al. (2020) the most commonly seen physical symptoms in patients with lung cancer are cough (86.3%), lack of energy (74.3%), dyspnea (70.1%), weight loss (66.2%), sweating (63.2%), feeling sad and nervous (61.5%), dry mouth (60.2%), and pain

(58.5%). Depending on these symptoms, the quality of life (QoL) of patients decreases significantly (Polanski et al., 2016).

The concept of QoL usually includes perceptions related to positive and negative sides of symptoms experienced with physical, emotional, social, and cognitive functions of individuals (Lavdaniti and Tsitsis, 2015). Patients with lung cancer could experience low QoL due to the high uncertainty and distress of illness (Lee and Kim, 2018). Beside of global QoL, functional subscale of QoL include such as physical, role, emotional, cognitive, and social domains is also affected negatively in patients with lung cancer (Guvencli et al., 2021). In the literature, the importance of developing strategies to improve the QoL of patients with lung cancer by managing their symptoms is emphasized (Kim, 2021). In order to reduce symptom distress and increase QoL, it is necessary to provide more detailed, and systematic information to patients (Lee and Kim, 2018). Initiatives to increase patients' QoL are important to relieve patients, to decrease symptoms, and to provide holistic well-being to individuals (Lin et al., 2013).

While digital transformation takes place in daily life, these technological developments offer numerous opportunities for patient education. Web-based education is one of the frequently used methods for this purpose. Web-based education informs patients with cancer and chronic disease about their care during the disease and empowers them (Ruland et al., 2013). Web-based education may contribute to symptom management of cancer patients by providing with timely, when needed, easily accessible interactive web-based symptom self-monitoring, information, and support (Fridriksdottir et al., 2018). The web-based education offers many opportunities for patients with lung cancer that ensure symptom management and improve quality of life (Huang et al., 2019). Despite the many advantages of web-based education, the usability, acceptability and accessibility of digital technologies differ in each society. Thus, it is very important to evaluate the effectiveness of web-based education also for Turkish patients with lung cancer. There has been no website or study prepared for Turkish patients to provide symptom management or improve the QoL of patients with lung cancer. This study was

conducted to investigate the effect of web-based education on symptom management and QoL for patients with lung cancer.

Research questions: The research questions were:

1.   Does web-based patient education effective to reduce symptom intensity in outpatient chemotherapy patients with lung cancer?
2.   Does web-based patient education effective to increase the quality of life of outpatient chemotherapy patients with lung cancer?

Methodology

Study Design: The present was a quasi-experimental study, using a pre- and post-repeated measures design. The study was performed between May and December 2014. To carry out the study, written permission was obtained from the the Non-Interventional Clinical Research Ethics Committee (Number: B.30.2.AKD.0.20.05.05) and hospital director (Number: 84768725/PER-1398-1969). Informed consent was obtained from the patients who participated in the study.

Participant Sample: A convenience sample of patients with lung cancer was selected from a Daily Chemotherapy Unit of a University Hospital in Republic of Turkey. The inclusion criteria were the following:

(1) $\geq$ 18 years old; (2) diagnosed with lung cancer and knew the diagnosis;
(3) within the first three chemotherapy cycles;
(4) able to use a computer or a mobile phone and had internet access; and
(5) agreed to participate in the study.

According to the records of University Hospital, 78 people presented to the Daily Chemotherapy Unit during this period to receive chemotherapy treatment. As a result of our interviews, 30 patients who met research inclusion criteria were included in the research scope. The flow chart of the study is given in Figure 1.

The Intervention

Preparation of the Website: The website content was developed based on the literature review by the researchers. It was prepared to meet the informational needs of patients with lung cancer in accordance with current guidelines (DiSalvo et al., 2008, Ripamonti et al., 2012, Simmons et al., 2012). The website consisted of two main parts: (1)

General information and (2) Symptom management. Entrance to the website was provided through personal user names and passwords. It was possible to access the educational website from any location, provided a desktops, tablets, and smartphones with an internet connection was available. The website included no interactive sessions, social interactions, or support groups. However, it featured a message box that allowed patients to send individual messages to researchers. Moreover, all scales related to symptom and QoL assessment with the title of "User questionnaire" and System Usability Scale with the title of "Website questionnaire" were included on the website. Visitor statistics of website were measured using Google Analytics.

Procedure: All patients who met the inclusion criterias were informed about the research in the daily chemotherapy unit. An informed consent was received from the patients who agreed to participate in the study. After data collection instruments were filled in, the website was introduced to patients and created a patient account to log in to the website with a password. Then, they were informed about they could use the website when they need during three months. The patients were told how to fill in the online data collection instruments during the follow-up period. Patients visited the website whenever they needed to manage the symptom that they experienced intensely or wondered about. During the follow-up period, the number of times the patients entered the website and the average duration of stay on the pages were recorded in the database. There was no limit regarding the use of the website, and it was questioned whether patients used the website actively or not during each follow-up. Technical support was provided for the problem experienced by patients who did not use the website for any reason.

Data Collection: Patients were assessed at 4 time points: baseline assessment (T0) was conducted the beginning of the education, and in the 2nd week (T1), in the 6th week (T2), and in the 12th week (T3) as shown in Figure 2. Data collection instruments were filled in using face-to-face interview technic at T0. Patients were expected to fill in the data collection forms online at T1, T2, and T3. The response time for the questions was around 15-20 minutes. During the follow-up period, the patients' data who were unable to enter data in the follow-up date due to internet access problems or other technical reasons was received on the phone or by face-to-face interviews. These data were recorded in the system by the administrator panel.

Instruments: In this study, Personal Information Form, The Modified Borg Dyspnea Scale (MBS), The Lung Cancer Symptom Scale (LCSS), and EORTC QLQ C-30 Quality of Life Scale and LC-13 were used in order to collect patients data. The validity and reliability studies of all measurement instruments used in the study were conducted.

Personal Information Form: Personal Information Form was prepared by the researcher and consisted 12 items including sociodemographic information and disease characteristics.

The Modified Borg Dyspnea Scale: It is a 12-point scale (0, 0.5, 1-10) that is frequently used to evaluate the severity of dyspnea on exertion and at rest. A high score from the scale indicates that the severity of dyspnea is high (Borg, 1982).

The Lung Cancer Symptom Scale: It is a self-assessment scale with 9 items. The average of these nine items gives the total score. A low score from the scale indicates low symptom intensity and high quality of life (Hollen et al., 1994, Hollen et al., 1999). In this study, the Cronbach-α coefficient of the scale was found to be 0.89.

EORTC QLQ C-30 Quality of Life Scale and LC-13: It is a self-assessment scale with 30 items including "Functional (15 items)", "Symptom (13 items)" and "General Health Status (2 items)". A higher score on the functional scale indicates higher functional status, a higher score on the global QoL scale indicates higher QoL, and a higher score on the symptom scale indicates more intense symptoms (Aaronson et al. 1993). In this study The Cronbach-α coefficient of the scale was found to be 0.88. The scoring of the Quality of Life Scale LC-13 was done through the symptom scale scoring. A higher score from the LC-13 indicates more intense symptoms (Aaronson et al. 1993). The Cronbach-α coefficient in this study was found to be 0.80.

Data Analysis: Data were analyzed using in the Statistical Package for Social Science (SPSS software (Armonk, NY, USA), version 21.0, for Windows. Descriptive statistics were used to analyze sociodemographic data, and Friedman test

was used to evaluate whether there was a difference between the measurements. A 95% significance level (α = 0.05 error margin) was determined in the analysis.

Results

Sociodemographic Characteristics: Characteristics of study participants are shown in Table 1. It was determined that most of the patients were male (85.7%), married (89.3%) and primary school graduates (75%). The average time since diagnosis of the patients was 5.43± 3.38 weeks, 64.3% were in stage IV, all had metastasis of the disease, and 75% of the patients stated that they needed education.

The Use of Website by the Patients: It was determined that the three sections of the website that users visited most were: *What is Cancer* (1727 entries), *Nausea and Vomiting* (1384 entries), and *Cough and Hemoptysis* (915 entries). It was determined that the first three sections that the patients stayed on the longest were: *Surgical Therapy* (56%), *Cough and Hemoptysis* (26%), and *How is Lung Cancer Diagnosed.*

Symptom Burden and Quality of Life: The distribution of the mean scores of the MBS, the LCSS, the EORTC QLQ-C30, and LC-13 are shown in Table 2. No significant difference was found between the mean scores of measurements of the MBS, and the LCSS (p>.05). EORTC QLQ-C30 consists of three parts: Functional scale, Symptom scale, and Global Quality of Life. After the intervention, the mean score of social function had a tendency to increase, and a significant difference was found between the measurements (p<.05). It was determined that the mean scores of physical, role, emotional, and cognitive sub-dimensions had a tendency to increase compared to the baseline measurement in the follow-ups and there was no significant difference between the measurements (p>.05). While the mean score of fatigue and insomnia had a tendency to decrease, the mean score of nausea had a tendency to increase and a significant difference was found between the measurements (p<.05). Global quality of life mean score tended to decrease, however no significant difference was found between the measurements (p>.05). In the analysis of the LC-13, it was found a significant difference between the mean score of dyspnea, and alopecia measurements (p<.05).
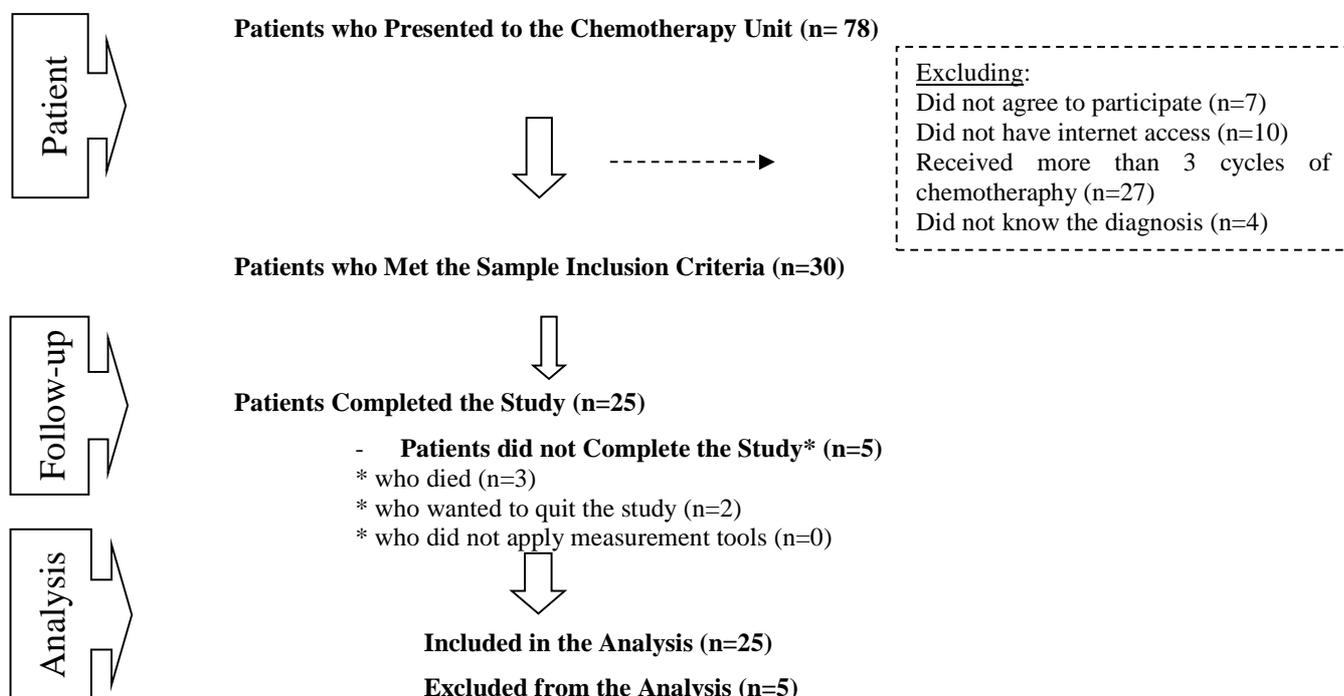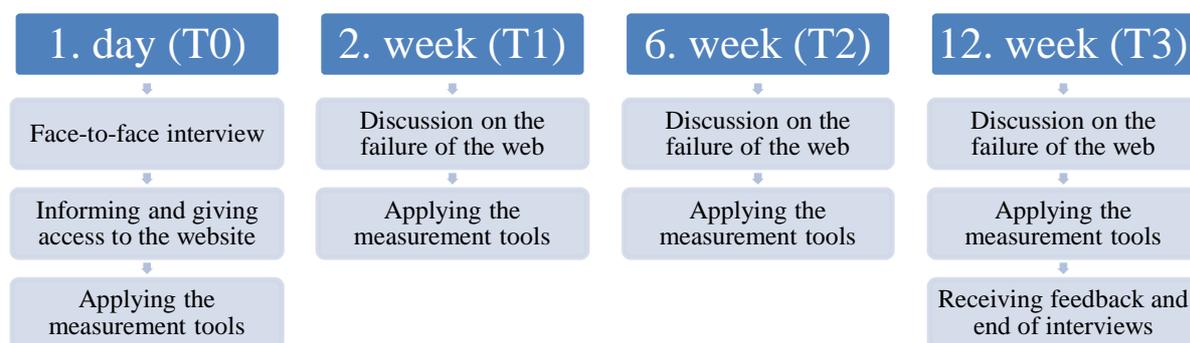

Figure 1: Sample Diagram

1. day (T0)	2. week (T1)	6. week (T2)	12. week (T3)
Face-to-face interview	Discussion on the failure of the web	Discussion on the failure of the web	Discussion on the failure of the web
Informing and giving access to the website	Applying the measurement tools	Applying the measurement tools	Applying the measurement tools
Applying the measurement tools			Receiving feedback and end of interviews

Figure 2: Research Process

Table 1. Sociodemographic Characteristics of Patients (n=28)

	n	%
Age		
54 and ↓	6	21.4
55 – 59	6	21.4
60 – 64	7	25.0
65 and ↑	9	32.2
Mean age ($\bar{X}\pm SD$) 60.89±8.8		
Gender		
Female	4	14.3
Male	24	85.7
Education		
Primary school	21	75.0
High school	3	10.7
Higher education	4	14.3
Received information about chemotherapy		
Yes	26	92.9
No	2	7.1
Perceived Education Need		
Yes	21	75.0
No	7	25.0
Disease Characteristics of Patients (n = 28)		
Diagnosis Period Average diagnosis period ($\bar{X}\pm SD$) 5.43 ± 3.38		
0-4 weeks	13	46.4
5-8 weeks	12	42.9

9 and ↑ weeks	3	10.7
Stage		
II	1	3.6
III	9	32.1
IV	18	64.3
Metastasis		
Yes	28	100.0
No	0	0.0

Table 2. The Distribution of the Mean Scores of MBS, AKSS, and EORTC QLQ-C30 Global Quality of Life Scales in terms of Follow-ups* (n=25)

SCALES	($\bar{X}\pm SD$)				Chi-Square	P*
	I. Measurement	II. Measurement	III. Measurement	IV. Measurement		
MBS	1.84±1.14	2.08±1.15	1.92±1.07	2.40±1.11	6.437	.09
LCSS	30.24±12.42	30.12±13.46	30.32±16.06	30.44±16.99	.455	.92
EORTC QLQ-C30						
Functional	55.91±18.26	65.44±19.83	65.20±19.86	63.72±25.86	6.951	.07
Physical	48.53±20.68	53.60±21.98	53.06±24.83	52.26±26.64	.896	.82
Role	42.00±31.22	64.00±34.92	56.66±33.33	64.66±38.58	7.832	.05
Emotional	62.00±29.17	68.00±30.11	70.33±20.70	68.66±23.84	3.284	.35
Cognitive	78.00±31.07	86.00±19.64	81.33±22.73	81.33±23.23	4.181	.24
Social	54.00±37.96	71.33±33.16	77.33±30.00	64.00±38.09	10.037	**.01**
Symptom	32.10±15.11	35.07±18.70	31.17±19.56	29.74±21.44	2.402	.49
Fatigue	65.33±33.38	56.44±31.90	56.00±32.47	49.77±32.57	11.056	**.01**
Nausea and vomiting	2.00±5.52	16.00±25.22	9.33±15.27	10.66±18.55	10.252	**.01**
Pain	24.66±30.47	34.66±32.95	33.33±32.63	34.66±33.30	2.546	.46
Dyspnea	28.00±34.26	34.66±31.15	25.33±32.31	33.33±31.91	4.132	.24
Insomnia	53.33±41.94	49.33±32.08	33.33±37.26	33.33±30.42	8.353	**.03**
Appetite loss	20.00±25.45	30.66±33.22	32.00±36.61	20.00±31.91	4.659	.19
Constipation	24.00±37.90	25.33±33.72	21.33±30.24	20.00±30.42	.352	.95
Diarrhea	8.00±24.11	20.00±31.91	13.33±30.42	9.33±24.57	5.964	.11
Financial difficulties	34.66±40.23	25.33±36.36	26.66±37.26	30.66±33.22	2.019	.56
Global	58.00±22.75	53.66±25.46	51.00±24.92	57.00±32.33	3.054	.38
LC-13						
Cough	34.66±32.60	26.66±21.51	22.66±15.86	25.33±19.90	3.043	.38

Hemoptysis	6.66±13.60	1.33±6.66	1.33±6.66	5.33±12.47	7.286	.06
Dyspnea	34.22±28.85	27.11±22.69	31.55±24.98	41.33±27.87	8.124	**.04**
Sore Tongue	10.66±28.41	8.00±17.42	12.00±30.24	6.66±13.60	.289	.96
Dysphagia	17.33±34.85	10.66±18.55	12.00±23.33	18.66±27.35	2.512	.47
Tingling Hands or Feet	20.00±28.86	17.33±27.41	28.00±31.44	28.00±34.26	7.048	.07
Hair Loss	8.00±22.11	22.66±38.15	36.00±47.06	37.33±46.46	10.634	**.01**
Chest Pain	18.66±27.35	17.33±27.41	13.33±21.51	24.00±35.38	1.119	.77
Arm Pain	13.33±30.42	14.66±28.99	16.00±30.61	22.66±30.00	3.881	.27

* Friedman Test; MBS: The Modified Borg Dyspnea Scale; LCSS: The Lung Cancer Symptom Scale; LC2 13: EORTC QLQ C-30 Quality of Life Scale&Lung Cancer Module

Discussion

This study was conducted to investigate the effect of web-based education on symptom management and QoL for patients with lung cancer. The results of this study showed that fatigue and insomnia symptoms of patients decrease over time as a result of the web-based patient education, while nausea, hair loss, and dyspnea symptoms increase over time. After the intervention, an increase in mean social function scores of patients was observed.

Fatigue and insomnia are interrelated symptoms that are among the most common symptoms experienced by patients with lung cancer (Lin et al., 2013, Yang et al., 2020, Papadopoulos et al., 2019) Disease- and treatment-related factors influence the worsening of these symptoms in patient with lung cancer over time (Dean et al., 2019, Carnio et al., 2016). They are being considered as an important quality of life issue by patients with lung cancer. Our study participants were experienced these symptoms maximally on the first follow-up, and the symptoms decreased as a result of intervention. The benefit of web-based education is meaningful because patients suffer from fatigue and insomnia mostly. Moreover, the study results are consistent with prior studies, that found web-based interventions is effective to reduce fatigue and insomnia in cancer patients (Galiano-Castillo et al., 2016, Spahrkas et al., 2020, Soh et al., 2020, Rha et al., 2020). Patients who receive evidence- and technology-based symptom management education can better cope with their symptoms after chemotherapy (Grašič Kuhar et al., 2020). It is recommended to develop and disseminate evidence- and technology based,

standardized, and interactive web-based education programs for symptom management of patients with lung cancer.

Lung cancer has a poor prognosis with poor patient survival periods (Alpay et al., 2015). Dyspnea is one of the most frequently observed and difficult symptoms for patients with lung cancer (Silvoniemi et al., 2016, Yang et al., 2020, Martin et al., 2021). It is thought that the reason for the worsening of dyspnea severity at the last follow-up of our study was the prognosis of the disease. As respiration is a vital function; it is known that dyspnea negatively affects patients' quality of life (Damani et al., 2019, Silvoniemi et al., 2016). Dyspnea management should be the focus of symptom management of patients with lung cancer due to the its vital importance. Chemotherapy-induced alopecia occurs from days to weeks after the first chemotherapy cycle, and it is generally reversible 3–6 months postchemotherapy (Shin et al., 2015, Rossi et al., 2017). It is assumed that the increase in alopecia scores of the patients in our study is based on this situation.

There are several factors related to QoL in lung cancer patients undergoing chemotherapy (Hung et al., 2018). QoL indicators are described as the ability to adapt and alter one's social roles in life while remaining mentally well (Polanski et al., 2016). So that, social function is one of the important QoL indicators (Ediebah et al., 2014). In our study, social function scores of patients improved, and their QoL increased after the intervention, which we assume can be considered significant gains. On the one hand, the study results are consistent with prior study that conducted in

Turkey to to determine the therapeutic effects of nurse telephone follow-up for lung cancer patients (Hintistan et al., 2017). On the other hand, in some studies web-based education did not provide any significant change in social function scores of patients with cancer (Huang et al., 2019, Beatty et al., 2019). We believe that these results emerge as a result of sociocultural structure of society. A study results conducted by Williams et al. (2019) concluded that greater than two-thirds of participants reported a social support need, with nearly one-half having unmet needs (Williams et al., 2019). However in Turkey, studies showed that study cancer patients received and perceived a high amount of social support (Ozbayir et al., 2019, Uslu-Sahan et al., 2019).

Improving QoL in patients with lung cancer is essential to improve quality of care, treatment outcomes, and survival (Gu et al., 2018). In our study, mean scores of global quality of life was not statistically different. Similar to our study results, a meta-analysis concluded that there was no evidence for effects of web-based interventions on QoL among cancer patients (Wang et al., 2020). However, in many studies, it was found that web-based implementations enable access to health services for cancer patients, improve symptom management, and increase quality of life (Donovan et al., 2014, DuBenske et al., 2010, Ruland et al., 2013, Luo et al., 2020, Attai et al., 2015, Huang et al., 2019). In the literature, it is emphasized that innovative, standardized, efficient, supportive cancer care methods should be administered to patient care to improve the QoL of patients (Silvoniemi et al., 2016).

Conclusion: To summarize, it was concluded that fatigue and insomnia symptoms experienced by patients decreased over time while nausea, hair loss, and dyspnea increased over time. In addition, at the end of the education period, an increase was observed in social function mean scores of the patients. These results showed that the use of a web-based patient education program positively affect symptom management of patients. Reducing the symptom severity of patients with lung cancer and improving their quality of life is possible through the use of innovative approaches in patient education. Studies with larger sample size and longer follow-up periods are needed to investigate the effects of web-based educational interventions on the quality of life of patients with lung cancer. It is also recommended to integrate an interactive session, social network or support groups into study designs.

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