The Effect of Telehealth Intervention on Symptom Management in Cancer Patients: A Systematic Review

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OBJECTIVE

The objective of this study was to evaluate the effect of telehealth application on symptom management in cancer patients.

METHODS

Literature search on the subject was searched in Ebscohost, Cochrane Library, ProQuest, PubMed, Science Direct, Google Scholar, Web of Science, and DergiPark databases between April 1 and May 1, 2023. The inclusion and exclusion criteria of the study were determined in accordance with the population, intervention, comparison, outcome and study design, studies published in peer-reviewed journals in systematic review, published in English and Turkish, with cancer patients aged 18 years and over, and the full text of which can be accessed. RoB 2 and ROBINS-l assessment tools were utilized to evaluate the risk of bias in the included studies.

RESULTS

In the study, 877 studies were analyzed and randomized controlled (n=10) and quasi-experimental studies (n=3) were identified that met the inclusion criteria. It was determined that the physiological and psychological symptoms decreased and the quality of life increased with the telehealth applications. In only one study, it was determined that telehealth application did not change the quality of life, and in another study, it had no effect on diarrhea symptoms.

CONCLUSION

There is no optimal duration and technique of telehealth application used in symptom control of cancer diseases. The applied telehealth method has increased the quality of life by providing symptom control. For this reason, it is recommended that health professionals should include telehealth applications in the care practices of cancer patients, both in symptom control and in improving their quality of life.

Keywords: Cancer; nursing; symptom; symptom management; telehealth.

INTRODUCTION

Cancer, a major health problem involving sequential mutations, uncontrolled cell proliferation and homeostatic imbalance, is the second leading cause of death worldwide.[1,2] According to the 2021 data of the Turkish Statistical Institute, cancer ranks second after deaths from circulatory system diseases in our country and its incidence is 14.0%.[3] According to the Global Cancer Observatory (Globocan) 2020 data, 17.6% lung cancer,

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10.3% breast cancer, and 9.1% colorectal cancer are among the most common cancers in Türkiye.[4] While there were 19.3 million newly diagnosed cancer patients worldwide in 2020, this number is expected to reach 28.9 million in 2040.[5] The presence of obesity, infections, ultraviolet radiation, and alcohol use are considered cancer risk factors.[6]

Treatment methods for cancer vary according to the stage and characteristics of the disease. Cancer patients experience negative symptoms due to the cancer disease and its treatments. It can cause many problems such as pain, nausea, vomiting, oral mucositis, fatigue, anemia, neutropenia, sleep disorders, and thrombocytopenia. [7] These symptoms negatively affect the quality of life of cancer patients along with physiological, psychological, and social conditions.[8]

Telehealth is the delivery, management, and coordination of health-care services that integrate information and telecommunication technologies to provide a wide range of health-care services.[9,10] Telehealth is a solution to close gaps and inequalities in health-care delivery and reduce pressure on the health-care system.[9] Telehealth systems overcome many of the obstacles in traditional health-care delivery and offer the opportunity for patient-centered healthcare that is both accessible and convenient.[11] Providing symptom management for individuals with chronic diseases such as cancer is one of the important benefits of telehealth services. With the telehealth systems implemented by health professionals, it is possible to evaluate the symptoms that cancer patients frequently experience together with the disease and treatment, the reasons for hospitalization, and infection rates. In this case, it provides symptom management of patients by planning their functional capacities, general health understanding, treatment, care, education, and counseling services. Thus, it increases patients' compliance with treatment and care.[12,13] In addition, telehealth applications provide many positive contributions such as managing many chronic conditions, preventing secondary complications, increasing functional capacity, reducing recurrent hospitalizations, controlling symptom management, improving health outcomes, preventing health inequalities, and providing easy access to health services.[14] Cancer patients need to be supported in symptom management not only in the hospital setting but also at home.[15] Telehealth technologies and services such as telephony, video conferencing, and applications such as internet-based interventions help bring telehealth technologies and services to the patient's home and assist in symptom management without the need to physically come to the hospital.[16] Therefore, telehealth interventions gain importance in terms of easy access to and protection of patients outside the hospital.[17] This systematic review was conducted to evaluate the effect of telehealth application on symptom management in cancer patients.

MATERIALS AND METHODS

The Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P)[18] reporting checklist was used in the development of the systematic review protocol and manuscript writing.

Research Questions
- Which cancer patient symptoms are addressed through the application of telehealth?
- What telehealth applications are utilized for cancer patients?
  o Which telehealth methods are used in the management of physiological symptoms in cancer patients?
  o Which telehealth methods are used in the management of psychological symptoms in cancer patients?
  o Which telehealth methods are used to improve the quality of life in cancer patients?
- Are telehealth applications effective in symptom management for cancer patients?

Search Strategy
To access the studies subject to this study, the search was limited to research articles published between April 1 and May 2023 between 2000 and 2023 in the Cochrane Library, PubMed, Google Scholar, Web of Science Core Collection, ProQuest Central, Science Direct, and DergiPark databases. Keywords were identified and the keyword combinations presented in Table 1 were used during the search.

Inclusion and Exclusion Criteria
Inclusion and exclusion criteria were determined in accordance with population, intervention, comparison, outcome and study design,[19] and randomized controlled trials and quasi-experimental studies published between 2000 and 2023 were included in the systematic review. In this context, the inclusion and exclusion criteria of the study are combined in Table 2.

Exclusion criteria; studies that do not meet the inclusion criteria, studies written in any language other than Turkish and English, and duplicate studies and studies whose full text cannot be accessed will not be included in the study.

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Table 1 Literature search

Keywords	English: Telehealth, Telemedicine, Telenursing, Teleconsultation, eHealth, mHealth, Digital Health, Telephone, Cellphone, Telegram, Web Based, Cancer Helplines, Cancer, Oncology, Neoplasm, Carcinoma, Tumor, Tumor, Malign, Symptom, Symptom Management Turkish: Telesağlık, Teletıp, Telehemşirelik, Telekonsültasyon, eSağlık, mSağlık, Dijital sağlık, Telefon, Cep telefonu, Telegram, Web tabanlı, Kanser yardım hattı, Kanser, Onkoloji, Tümör, Karsinoma, Malign, Semptom, Semptom yönetimi
Searching with English keywords	((Telehealth[Title]) OR (Telemedicine[Title]) OR (Telenursing[Title]) OR (Teleconsultation [Title]) OR (eHealth[Title]) OR (mHealth[Title]) OR (Digital Health[Title]) OR (Telephone[Title]) OR (Cell phone[Title]) OR (Telegram[Title]) OR (Web Based[Title]) OR (Cancer helplines[Title/Abstract])) AND ((Cancer[Title]) OR (Oncology[Title]) OR (Neoplasm[Title]) OR (Carcinoma[Title]) OR (Tumour[Title]) OR (Tumor[Title])) AND ((Symptom[Title/Abstract]) OR (Symptom Management[Title/Abstract]))
Searching with Turkish keywords	((Tele sağlık[Title]) OR (Tele tıp[Title]) OR (Tele hemşirelik[Title]) OR (Tele konsültasyon [Title]) OR (e Sağlık[Title]) OR (m Sağlık[Title]) OR (Dijital Sağlık[Title]) OR (Telefon [Title]) OR (Cep telefonu[Title]) OR (Telegram[Title]) OR (Web tabanlı[Title]) OR (Kanser yardım hattı[Title]) AND ((Kanser[Title]) OR (Onkoloji[Title]) OR (Tümör[Title]) OR (Karsinoma[Title]) AND ((Semptom[Title/Abstract]) OR (Semptom yönetimi[Title/Abstract]))

Table 2 PICOS model

| PICOS	Description
P (Population)	Individuals aged 18 years or older with cancer
I (Intervention)	Telehealth application
C (Comparison)	Ordinary care
O (Outcome)	Psychological symptoms
	Physiological symptoms
	Impact on quality of life
S (Study design)	Randomized controlled trials
	Quasi-experimental studies

Selection of Studies

The database search was conducted by the researchers. The PRISMA-P flowchart in Figure 1 was created to document the total number of articles identified in eligible publications along with the total number of publications in each database. The retrieved articles (n=877) were then transferred to the Mendeley library for further parsing and selection of suitable articles for the study. Duplicates (n=82) were found by importing them into the Rayyan Intelligent Systematic Review[20] program from the Mendeley library. It was decided to include n=13 studies by excluding the studies (n=864) with characteristics such as inappropriate study topic and research type and inaccessible full text.

Extraction of Study Data

Two independent researchers (FA-ÖÖ) were involved at each stage of this review. The search strategy, date of searches in each database, search terms, and number of publications found were recorded. A PRISMA-P flowchart was created to document the selection of eligible publications and the total number of articles. The articles found in the scans were exported to create a Mendeley database. Duplications were found by calculating with the Rayyan database. All reviews were used to filter article titles and abstracts by inclusion/exclusion criteria and categorized by one researcher (FA). The other researcher (ÖÖ) examined the titles and summaries in the exclusion category. The full text was independently assessed for appropriateness by two researchers (FA-ÖÖ). For all excluded studies, the reason for exclusion was noted in the PRISMA flowchart. It was approved by the research members before screening began. One researcher (FA) extracted data from the included articles and completed the database. The other researcher (ÖÖ) independently checked the accuracy of the data extraction and database.

Methodological Quality

In terms of the quality of the studies included in the review, ten randomized controlled trials21 were evaluated

Fig. 1. Flow-chart of the studies selection process.
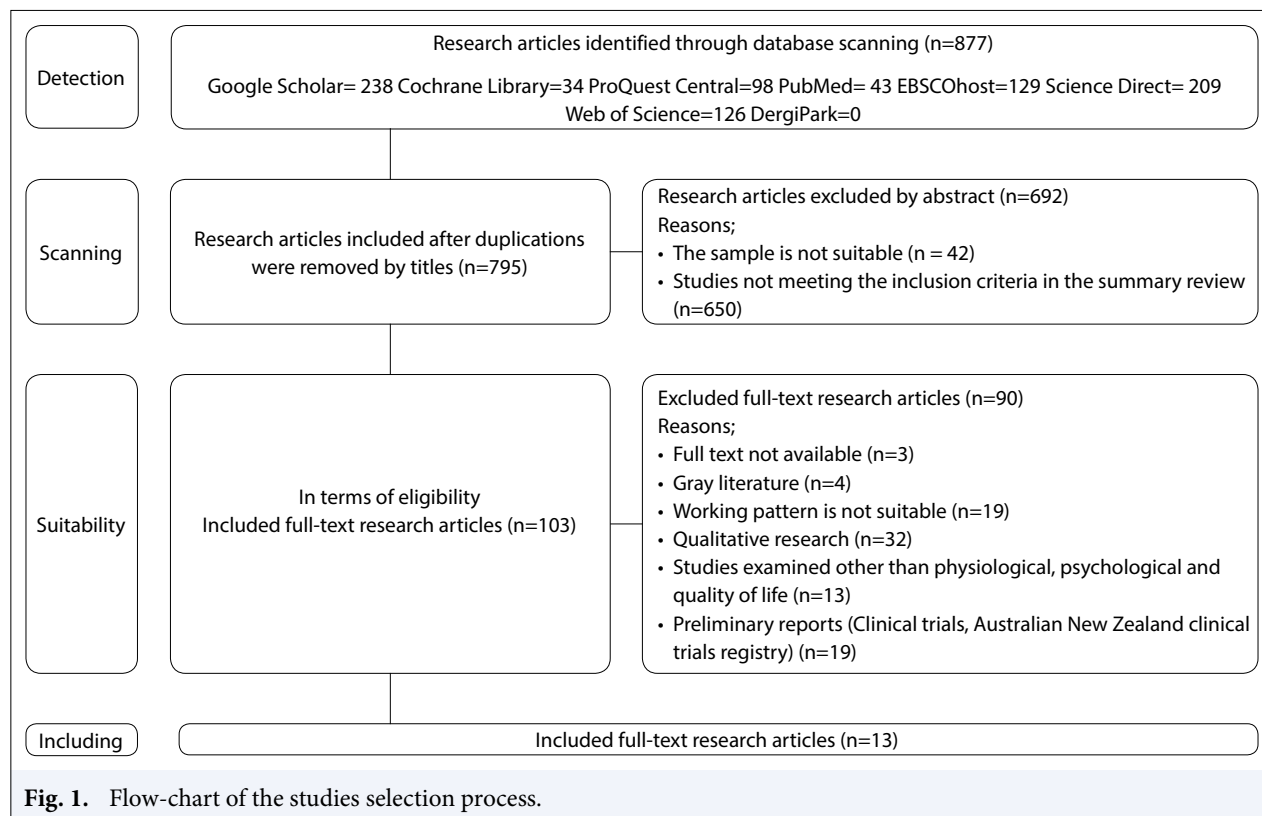
by the investigators (FA, ÖÖ) according to the checklist for randomized controlled trials created by the Joanna Briggs Institute (JBI). It consists of 13 items and the items in the checklist assess selection, performance, identification, and omission bias. Each item in the checklist is scored as "Yes=1, No=0, Uncertain=0, or Not Applicable=0." The maximum score for randomized controlled experimental studies is 13. The higher the total score of the studies, the higher the methodological quality. [21] According to the checklist for quasi-experimental studies created by JBI, three quasi-experimental studies were evaluated. It consists of nine items. Each item in the checklist is scored as "Yes=1, No=0, Uncertain=0, or Not Applicable=0." The maximum score for quasi-experimental studies is 9. The higher the total score of the studies, the higher the methodological quality (Table 3).[22]

Risk of Bias Assessment
The quality of the selected randomized controlled trials was assessed according to six criteria (randomization process, deviations from the intended interventions, outcome measurement bias, missing outcome data, reported outcome bias, and overall bias) in the Cochrane Risk of Bias (RoB 2). According to these criteria, the risk of bias of the studies was classified as "high risk of bias," "risk of suspected bias," and "low risk of bias"

(Table 4).[23] The "Risk Of Bias In Non-Randomized Studies – of Interventions (ROBINS-1)" was used for the quality of the selected non-randomized quasi-experimental studies (Table 5).[24]

Ethics of the Study
Since the research data were obtained from publications scanned from the literature, there is no need for Ethics Committee approval. All articles included in the study were cited and indicated in the bibliography. The research protocol was registered in the PROSPERO (International Prospective Register of Systematic Reviews) database, which allows the registration of systematic reviews and meta-analysis studies, with the registration number CRD42023417975.

Limitation of the Research and Contribution to the Field
This systematic review is limited to the databases searched and the studies conducted between 2000 and 2023, the full text of which can be accessed, written in Turkish and English languages, and no Turkish study was found as a result of the searches. Another limitation is that studies other than randomized controlled trials and quasi-experimental studies were not included in the review. The study was limited to n=13 studies included in the sample.

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Table 3 Methodological quality evaluations of studies

Working tags	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8	Criterion 9	Criterion 10	Criterion 11	Criterion 12	Criterion 13	Total (%)
Shepherd et al., 2006*	+	+	−	−	−	+	+	+	+					6/9 (66.6%)
Kearney et al., 2009	+	+	+	+	?	?	+	+	+	+	+	+	+	11/13 (84.61%)
Killbourn et al., 2013*	+	+	−	−	?	+	+	+	+					6/9 (66.6%)
Donovan et al., 2014	+	?	+	?	?	?	+	+	+	+	+	+	+	9/13 (69.2%)
Van den Berg et al., 2015	+	+	+	−	+	?	?	−	+	+	+	+	+	9/13 (69.2%)
Pfeifer et al., 2015	+	?	+	?	?	?	+	+	+	+	+	+	+	9/13 (6.2%)
Mooney et al., 2017	+	+	+	+	−	?	?	+	+	+	+	+	+	10/13 (76.9%)
Huang et al., 2019	+	+	+	+	?	?	+	+	+	+	+	+	+	11/13 (84.61%)
Plumb Vilardaga et al., 2020*	+	+	−	−	?	+	+	+	+					6/9 (66.6%)
Benzo et al., 2022	+	+	+	?	?	+	+	+	+	+	+	+	+	11/13 (84.61%)
Huggins et al., 2022	+	+	+	+	+	+	+	+	+	+	+	+	+	13/13 (100.0%)
Cetin et al., 2022	+	+	+	+	?	?	−	+	+	+	+	+	+	10/13 (76.9%)
Bektas et al., 2022	+	+	+	+	+	−	+	+	+	+	+	+	+	12/13 (92.3%)

+: Yes; −: No; ?: Uncertain / It is invalid; Criterion 1 – 13; JBI Criteria for the systematic review checklist for randomized controlled trials; *: Criterion 1–9; JBI Criteria from the systematic review checklist for quasi-experimental studies

Table 4 Bias assessments according to the Cochrane bias assessment tool (ROB-2) of randomized controlled trials included in the review

Criteria	Studies included in the review									
	Kearney et al., 2009	Donovan et al., 2014	Van der Berg et al., 2015	Pfeifer et al., 2015	Mooney et al., 2017	Huang et al., 2019	Benzo et al., 2022	Huggins et al., 2022	Cetin et al., 2022	Bektas et al., 2022
Random sequence generation (selection bias)	+	+	+	+	+	+	+	+	+	+
Allocation concealment (selection bias)	?	+	+	+	+	?	?	+	?	+
Blinding of participants and personnel (performance bias)	+	?	+	+	+	+	+	?	+	+
Blinding of outcome assessment (detection bias)	?	+	+	?	+	+	+	+	+	?
Incomplete outcome data (attrition bias)	+	!	+	+	?	?	?	+	?	+
Selective reporting (reporting bias)	+	+	?	+	+	+	+	+	+	+

+: Low Risk of Bias; ?: Risk of Suspicious Bias; !: High Risk of Bias. ROB-2: The Risk of Bias-2

Methodological differences such as the forms and scales used in the studies, the number and composition of the sample, and the type and interpretation of relevant variables are important limitations. This study is important for health professionals, who are users of telehealth applications, to include telehealth applications in their care plans, and to guide the planning of experimental studies on this subject in our country. Telehealth applications will contribute to the literature, patients, health-care professionals, and managers to follow and control the symptoms of cancer patients, increase access to health-care services, maintain treatment, and improve health outcomes such as quality of life, morbidity, and mortality.

RESULTS

Characteristics of the Studies Included in the Review

Study Design
In the review study, a total of 13 studies published between 2000 and 2023, including ten randomized controlled trials and three quasi-experimental studies were included in the study.[25–37]

Evaluation of Methodological Quality of Studies and Risk of Bias
Randomized controlled trials included in the systematic review received an average score of 9 (min:9; max:13) in the methodological quality assessment, and quasi-experimental studies received an average score of 6 in the methodological quality assessment (Table 3).

Risk of bias assessments of randomized controlled trials is presented in Table 4 and risk of bias assessments of quasi-experimental studies is presented in Table 5.

Country
The reviewed studies were conducted in the United Kingdom (n=1), United States of America (n=6), Netherlands (n=1), Taiwan (n=1), Australia (n=2), and Türkiye (n=2). The study was conducted within units and institutions such as cancer center, university hospitals, medical center, and chemotherapy unit.

Participant
The total number of participants in the studies included in the systematic review was 1164 and consisted of patients diagnosed with breast cancer, colorectal cancer, lung cancer, ovarian cancer, head and neck cancer, cancer patients, prostate cancer, and upper gastrointestinal cancer. The ages of the participants who accepted to the study were 18 years and older (Table 6).

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Table 5 Bias evaluations of quasi-experimental studies included in the review according to Risk of Bias in Non-Randomized Studies-of Interventions (ROBINS-1)

Criteria	Studies included in the review		
	Shepherd et al., 2006	Killbourn et al., 2013	Plumb Vilardaga et al., 2020
1 Bias due to confounding	Medium risk	Medium risk	Medium risk
2 Bias in selection of participants into the study	Medium risk	Medium risk	Medium risk
3 Bias in classification of interventions	Low risk	Serious risk	Medium risk
4 Bias due to deviations from intended interventions	Serious risk	Medium risk	Low risk
5 Bias due to missing data	Low risk	Medium risk	Low risk
6 Bias in measurement of outcomes	Low risk	Serious risk	Low risk
7 Bias in selection of the reported result	Low risk	Medium risk	Medium risk

Type and Content of Intervention

The studies included in the systematic review, used mobile phone-based remote monitoring,[26] web-based message boards,[28] video-based disease self-management (e-health),[29] a simple telehealth messaging device[30] connected to a home phone, a daily phone call with an automated system,[31] web-based telehealth methods,[32,34] telephone and internet-based mobile application,[35] telephone-based telehealth methods,[27,36] remote video conferencing method,[25] and finally a telephone interview.[33]

Intervention Time

In the studies analyzed, the intervention period varied between a minimum of 2.5 months and a maximum of 4.5 months.[29,35,36]

Evaluation Criteria

The evaluation criteria for the studies included in the systematic review were physiologic symptoms, psychological symptoms, and quality of life measures. Secondary outcomes include social support,[27] sleep difficulties,[31] nutritional status,[35] and self-efficacy.[37]

Impact of Telehealth Interventions on Symptom Management

In the studies included in the systematic review, the effect of telehealth intervention on symptom management in cancer patients and the effectiveness of telehealth after the intervention were evaluated (Table 6). In addition to physiological symptoms, psychological symptoms and quality of life, symptoms such as social support, sleep difficulties, nutritional status, and self-efficacy were evaluated after interventions using telehealth applications. In the studies, we included in the review, it was generally found that telehealth interventions reduced physiological and psychological symptoms and improved quality

of life. Only one study found that the telehealth intervention did not change the quality of life[35] and another study found that it had no effect on the symptom of diarrhea, a physiological symptom (Table 7).[31]

DISCUSSION

In this systematic review, the results of 13 studies examining the effect of telehealth on symptom management in individuals with cancer were discussed.

It is seen that telehealth applications applied in the studies included in the review were applied to patients diagnosed with cancer such as breast cancer, colorectal cancer, ovarian cancer, head and neck cancer, lung cancer, prostate cancer, gastrointestinal cancer,[27–30,32,34,35] and cancer patients without a specific type.[25,31,33,36,37] The telehealth interventions implemented were telephone,[26,30,31,33,36] internet,[28,32,34,37] video,[25,29] and both internet and telephone[35] based interventions.

Telehealth application is known to be effective in the symptom management of cancer patients[28,30] and to support health care because it is easy to access health services,[14] convenient[11] and far from the treatment center of patients, and supports patients living in rural areas.[15] In some of the studies included in the review, it is seen that it is applied in areas far from the center.[26,28,29,33] Since telehealth applications support health services, we think that telehealth applications should be integrated into cancer patients at home, workplaces, and schools and should be included in the scope of complementary health insurance.

Most of the interventions usually took place over a period of 2.5–4.5 months. Interventions were provided on a weekly basis, either once or twice a week. These different interventions prevented comparisons

Table 6 Randomized controlled and quasi-experimental studies on symptom management of telehealth interventions in cancer patients

Author, year (Country)	Study design	Unit/organisation	Sample/age	Sample characteristics	Evaluated symptom	Evaluation tool	Intervention	Intervention time	Follow-up time	Telehealth application
Kearney et al.,[25] 2009* (UK)	RCS	5 specialist cancer centers and 2 local districts	n=112 Patients over 18 years of age	Patients with breast, colorectal and lung cancer	Physiological symptoms (nausea, vomiting, fatigue, mucositis, hand-foot syndrome and diarrhea)	Paper-based survey	Symptom management to symptoms that occur after chemotherapy and persist over a 48–72 h period	Reporting symptoms via cell phone twice daily and throughout four cycles of chemotherapy	-Before chemotherapy -Chemotherapy cycles (2,3,4 and 5)	Mobile phone-based, remote monitoring, advanced symptom management system (ASyMS)
Donovan et al.,[26] 2014* (USA)	RCS	19 through the nurse license compact and six through individual state licenses	n=65 Female patients over 18 years of age	Patients with ovarian cancer	Having more than three ovarian cancer symptoms based on patient reporting	Symptom representation questionnaire (SRQ)	- Participants who consented to the intervention were given an orientation book containing user ID, password and operating procedures. - Participants were generally informed by e-mail.	Reminder email every 10–14 days from the start	- Beginning - 2 weeks after the intervention - 6 weeks after the intervention	A training method delivered via web-based message boards (Written Representational Intervention to Relieve Symptoms).
Van den Berg et al.,[27] 2015* (Netherlands)	RCS	One university and five district hospitals in the Netherlands	n=150 Female patients over 18 years of age	Patients with breast cancer	Cancer symptoms (Stress, fatigue) Life quality Despair	Symptom Checklist-90 (SCL-90) European Institute for Cancer Research and Treatment Quality of Life Survey (EORTC QLQ-C30)	Internet-based cognitive behavioral therapy -Participants were informed by e-mail every week to maintain commitment.	16 weeks from start, weekly practice	- Beginning - 2 months after the intervention - 4 months after the intervention - 1st year after intervention.	eHealth BREATHE: video-based self-disease management.
Pfeifer et al.,[28] 2015* (USA)	RCS	Metropolitan university education clinic	n=86 Patients over 18 years of age	Patients with head and neck cancer	Stress Physiological and psychological symptoms	Functional Assessment of Cancer Treatment (FACT-G) Memorial Symptom Assessment Scale (MSAS)	- Evaluated by asking questions to be answered with a telehealth device. - If the patient did not respond for 3 days, the participant was contacted by the coordinator and asked the reason for the non-compliance.	- On the 1st day of treatment and at the end of treatment, patients should wait 5–10 min each day.	- Beginning - 3 weeks after the intervention - 3 weeks after treatment is completed	Disease management with a simple telehealth messaging device connected to a home phone (The Health Buddy Appliance Device)

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Table 6 Cont.

Author, year (Country)	Study design	Unit/ organisation	Sample/ age	Sample characteristics	Evaluated symptom	Evaluation tool	Intervention	Intervention time	Follow-up time	Telehealth application
Mooney et al.,[29] 2017* (USA)	RCS	Intermountain West a cancer center and a comprehensive cancer center in the South	n=178 Patients over 18 years of age	Cancer patients	Symptom distress (fatigue, nausea, vomiting, pain, numbness and tingling, weakness, diarrhea, depressed mood, difficulty sleeping, cyanosis, weakness, feeling nervous or anxious, pain in the mouth, difficulty thinking or concentrating)	Symptom severity (scoring 0-10, 0: no symptoms, 10: severe)	-Patients generated a total of twenty-nine different answers from the phone every day before noon in the phone calls with the automatic system.	Symptoms were monitored daily.	It was evaluated on the 7th day, 30th day, 60th day, 90th day, 120th day.	A daily phone call with an automated system
Huang et al.,[30] 2019* (Taiwan)	RCS	Pulmonology service of a medical center in northern Taiwan	n=55 Patients over 20 years of age	Patients with lung cancer	Symptom distress (nausea, vomiting, fever, infection, skin toxicity, diarrhea, oral mucositis, gastrointestinal disturbances) Life quality Stress	Eastern Cooperative Oncology Group Performance Status Scale (ECOG-PS) European Organization for Research and Treatment of Cancer Quality of Life Survey Symptom Distress Scale	-Web-based training was provided from the mobile phones of the participants.	- Every 2 weeks for 3 months	- After a baseline assessment followed by a 1, 2 and 3 month web-based health education program	A web-based health education program
Benzo et al.,[31] 2022* (USA)	RCS	Cancer center	n=192 Male patients over 50 years of age	Patients with advanced prostate cancer	Urinary incontinence Urinary irritation Bowel function Hormonal function Sexual function Depression	Extended Prostate Cancer Index Compound (EPIC-26) Patient-Reported Results Measurement Information System Fatigue Short Form (PROMIS)	- Group therapy (web-based cognitive behavioral stress management) was applied from the tablet given to the participants.	- Every week for 10 weeks	- Baseline was evaluated at 6 and 12 weeks.	Web-based cognitive behavioral stress management.

Table 6 Cont.

Author, year (Country)	Study design	Unit/ organisation	Sample/ age	Sample characteristics	Evaluated symptom	Evaluation tool	Intervention	Intervention time	Follow-up time	Telehealth application
Huggins et al.,[32] 2022* (Australia)	RCS	Upper GI^ clinic	n=111 Patients over 18 years of age	Patients with upper GI cancer	Life quality Nutritional status	EQ-5D-5L PG-SGASF	- Nutrition recommendations for symptoms were provided to the participants via the internet or mobile application.	Weekly or biweekly for 18 weeks	All groups were evaluated at 3, 6 and 12 months.	Phone and internet enabled mobile application (myPace)
Cetin et al.,[33] 2022* (Türkiye)	RCS	Daytime chemotherapy unit	n=90 Patients over 18 years of age	Cancer patients	Cancer symptoms Life quality	FACT-G Quality of Life Scale	- Symptom triage was provided to the participants via telephone.	- During the 3-month follow-up, the participants were called 9 times.	All groups were evaluated after 3 months.	Telephone symptom triage protocol (Tele-TRIAGE)
Bektas et al.,[34] 2022* (Türkiye)	RCS	Medical oncology university hospital	n=60 Patients over 18 years of age	Cancer patients	Symptoms Life quality Depression Self-sufficiency	EORTC QLQ-C30 The Rotterdam Symptom Checklist Beck depression scale	- Patient education was provided to the participants through the website.	-2 h a week for 3 months	All groups were evaluated after 3 months.	Web-based training program
Shepherd et al.,[35] 2006* (Australia)	Quasi-experimental study	Regional treatment center	n=25 Patients over 18 years of age	Cancer patients	Anxiety Depression Life quality	The hospital depression and anxiety scale FACT-G	-Cognitive behavioral techniques intervention for four or six sessions	-Weekly or if the patient is suitable, twice a week, one session for 1 h	-Just before the first date -Immediately after the last appointment and 1 month later	Remote video conferencing method
Killboum et al.,[36] 2013* (USA)	Quasi-experimental study	Radiation oncology clinic	n=16 Patients over 18 years of age	Patients with head and neck cancer	Stress Pain Life quality Social support	Effect of Event Scale Pain Disability Index FACT-G Interpersonal Support Rubric	Intervention to ease and alleviate symptoms (EASE)	-Eight sessions from the start	- Beginning - 1 month after the intervention - 3 months after the intervention	Phone-based psychosocial intervention method
Plumb Vilardaga et al.,[37] 2020* (USA)	Quasi-experimental study	Residents 60 meters from the medical center and two rural community cancer treatment clinics	n=24 Patients over 21 years of age	Patients with advanced cancer	Pain Tiredness Psychological distress	PDI Patient-Reported Results Measurement Information System Fatigue Short Form Hospital Anxiety and Depression Index	- Participants were provided with telephone treatment sessions.	- Four sessions of 45-60 minutes	- Remotely evaluated at baseline and after intervention.	Phone call

*: Control Group: Patients receiving usual care. ^GI: Gastrointestinal; EQ-5D-5L: Quality of life evaluation tool; PG-SGASF: Subjective Global Assessment; FACT-G: Functional Assessment of Cancer Treatment; PDI: Pain Disability Index

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Table 7 The effect of applied telehealth methods on symptom management

Outcomes	Shepherd et al., 2006	Kearney et al., 2009	Killbourn et al., 2013	Donovan et al., 2014*	Van den Berg et al., 2015	Pfeifer et al., 2015**	Mooney et al., 2017	Huang et al., 2019	Plumb Vilardaga et al., 2020	Benzo et al., 2022	Huggins et al., 2022	Çetin et al., 2022***	Bektaş et al., 2022****
Nausea vomiting		↓					↓						
Fatigue		↓			↓		↓	↓	↓				
Mucositis		↓											
Hand-foot syndrome		↓											
Pain			↓				↓	↓	↓				
Numbness and tingling							↓	↓					
Diarrhea		↓					↕	↓					
Fever								↓					
Infection								↓					
Skin toxicity								↓					
Gastrointestinal disturbances													
Urinary symptoms										↓			
Endocrine symptoms										↓			
Ovarian cancer symptoms													
Physiological symptoms				↓		↓	↓					↓	↓
Psychological symptoms						↓	↓						
Depressed mood							↓						
Feeling tense and anxious													
Difficulty thinking or concentrating													
Depression	↓				↓	↓				↓			↓
Stress	↓		↓										↓
Anxiety	↑		↑		↑			↑					
Life quality	↑		↑		↑			↑			↕	↑	↑

*: Although it is called a physiological symptom, it is not detailed; **: Although it is called physiological and psychological symptoms, it is not detailed; ***: Although it talks about the physiological symptoms in chemotherapy, there is no detailed information about the symptoms; ****: Symptoms are not detailed. ↓: Statistically significant decrease. ↑: Statistically significant increase. ↕: Statistically no difference

according to the length or frequency of the intervention. The studies did not apply a specific duration to a specific symptom, and the optimal duration, how long it should be applied and monitored, is unclear. These interventions were applied to cancer patients undergoing treatment, but it was not specified which drugs and doses were used with the telehealth intervention.

In a study published in 2011, Porter suggested that different types of interventions may be more or less effective depending on the stage of the disease.[38] According to this theory, it was observed that patients included in the study were generally administered telehealth interventions regardless of their cancer stage.

It is noteworthy that seven of the 13 studies included in our study were created with telehealth interventions[26,27,30,31,33,35,36] delivered over the phone. We think that telehealth interventions for cancer patients may be effective in addressing some common cancer-related symptoms. However, the study needs to be updated as more evidence becomes available for each type of cancer and each symptom that may occur.

Physiological Symptoms

The interventions included in our research were developed for physiological symptoms pain,[27,31,33] nausea, vomiting,[26,31,32] fatigue,[26,29,31,33] hand-foot syndrome,[26] numbness and tingling, fever, infection, skin toxicity, oral mucositis,[32] urinary incontinence, urinary irritation, bowel function, and hormonal function[34] and tested for symptom management ability. Telehealth interventions have been reported to be effective in reducing physiological symptoms in patient populations diagnosed with cancer, particularly in people with breast[26,29] and lung cancer.[26,32] Only one study found no effect of a telehealth intervention for diarrhea symptoms. [31] We predict that this may reflect the difficulties of coping with the symptom of diarrhea with daily short phone calls.

Cognitive behavioral intervention,[27] telephonic self-care management,[31] and short telephone sessions[33] were applied to cancer patients to manage pain symptom. In all three studies, telehealth interventions were found to be effective on pain symptoms.

Web-based training[32] was provided with advice on the use of pharmacologic use, the use of distraction and relaxation techniques, and dietary advice,[26] telephone self-care management[31] to manage symptoms of nausea and vomiting. These telehealth applications were found to be effective on nausea and vomiting symptoms.

To manage the symptom of fatigue, advice on pharmacological use, use of distraction and relaxation techniques, dietary advice,[26] BREATHE (self-help program) application,[29] and short phone call sessions[33] were applied. These methods have been reported to have a positive effect on the management of fatigue symptom.

One of the telehealth applications for diarrhea symptom is a web-based application[32] and the other is phone calls.[26,31] The telehealth interventions provided diarrhea symptom management in two studies. In the study conducted by Mooney et al.,[31] it was found that the telehealth method applied for diarrhea symptom did not have any effect.

In some studies, the symptoms assessed were not clear.[28,30,36,37] In these studies, symptoms were evaluated as physiological symptoms. When we evaluate these studies, web-based education application,[28] disease management application with a simple telehealth messaging device connected to the home phone,[30] symptom triage protocol application by phone,[36] and finally web-based education program[37] were applied to cancer patients. Research has reported that each of the telehealth interventions provided physiological symptom control.

Psychological Symptoms

In the interventions included in the review, it is seen that telehealth applications applied for psychological symptoms of cancer such as stress,[27,29,30] depression,[25,34,37] anxiety,[25] psychological distress,[33] depressive mood, feeling nervous and anxious, and difficulty in concentration[31] are the subject of research.

Web-based training applications[34,37] and psychological intervention sessions through video conferencing[25] were implemented to manage the symptom of depression. It was determined that the telehealth interventions positively affected the depression symptom.

To manage the stress symptom, cognitive behavioral intervention by telephone,[27] video-based BREATHE (self-help program) application,[29] disease management application with a simple telehealth messaging device connected to the home phone,[30] and web-based training[32] were applied. The telehealth methods applied were found to be effective in stress management.

Quality of Life

Telehealth interventions improve the quality of life of individuals with cancer by providing symptom management.[12] When we examined the results of the

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research, it was found that telehealth applications improved the quality of life.[25,27,29,32,36,37] In only one study, it was found that the telehealth method applied did not change the quality of life score.[35]

When we examine the studies included in the review one by one, it is seen that telehealth interventions are generally effective in symptom management. However, it is not clear whether telephone interventions alone or video-based applications or a combination of both are more effective in symptom management of cancer patients. In addition, there is heterogeneity in the studies. It is seen that similar symptoms are not evaluated with similar scales (Table 6). This makes it difficult to evaluate the effectiveness of telehealth intervention. Based on these results, it is unclear which telehealth intervention is superior for any cancer symptom, its optimal dose, duration, and technique.

CONCLUSION

Among telehealth methods, 9 telephone, 2 web and 2 video, 12 physiological, 9 psychological symptom management, and 6 quality of life oriented trainings and counseling with 16–192 (total n=1164) individuals in 2.5–4.5 months were effective in 43 outcomes and similar in 2 outcomes. Telephone was used in the symptom management of patients with breast, colorectal, lung, head-neck, and upper GI tract cancer, web applications were used in the symptom management of patients with lung, ovarian, and prostate cancer and video application was used in the symptom management of patients with ovarian cancer. In addition to routine practice in symptom management, telehealth applications that address reminder, health education and counseling will increase the quality of health service delivery and service quality of health-care organizations for patients with cancer. In this case, the above-mentioned telehealth interventions that will support pharmacologic interventions should include symptom management in all telehealth applications for cancer patients, which is not only a necessity but also an ethical obligation.

As a result, studies have reported that telehealth applications are effective in symptom control of cancer patients. Health professionals can provide symptom management for cancer patients by identifying patients' needs and incorporating telehealth applications into their care plans. In this means, it can contribute to a positive change in both the physiological and psychological well-being and quality of life of cancer patients.

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