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Telenursing Interventions for Patients With Cancer Receiving Chemotherapy: A Scoping Review

Aurora De Leo, MSN, RN, Gloria Liquori, MSN, RN, Sara Dionisi, PhD, RN, Fabrizio Petrone, MSN, RN,
Alessandro Spano, MSN, RN, Nicolò Panattoni, MSN, RN, Noemi Giannetta, PhD, RN,
Marco Di Muzio, PhD, RN, and Emanuele Di Simone, PhD, RN

PROBLEM IDENTIFICATION: To provide an overview of telenursing interventions, primary outcomes, and tools used in patients with cancer receiving chemotherapy, a scoping review was conducted.

LITERATURE SEARCH: PubMed®, Embase®, and CINAHL® databases were searched using the following keywords: *telenursing*, *adverse event*, and *drug therapy*.

DATA EVALUATION: From the screening process, 11 studies were identified.

SYNTHESIS: In patients with cancer receiving chemotherapy, telenursing interventions were mainly used to monitor symptoms, particularly fatigue, anxiety, and depression. The interventions used included outcome-specific, nonspecific, and validated tools, or tools developed from reporting systems for adverse events.

IMPLICATIONS FOR RESEARCH: Large-scale, well-conducted randomized controlled trials, systematic reviews, and meta-analyses are needed to test the results of this scoping review.

KEYWORDS telenursing; chemotherapy; adverse events; oncology nursing; cancer

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The care pathway of patients with cancer involves a strong integration among healthcare organizations, healthcare professionals, patients, family members, and caregivers (World Health Organization, n.d.). Improvements in cancer-related treatment have led to an increase in cancer survivors and a consequent increase in the needs of patients with cancer. Patients receiving chemotherapy or oral cancer treatments frequently experience side effects or symptoms as a result of the disease or its treatment (Chae et al., 2022; Zerillo et al., 2018). Using oral chemotherapies poses numerous challenges in patients with cancer, including toxicity management and therapeutic adherence. However, these symptoms are often underestimated and underreported in health records by clinicians (Carrasco & Symes, 2018).

In nursing care, telenursing—a branch of eHealth—is the application of electronic technology to health (Scantlebury et al., 2017). Telenursing can improve data transmission and patients' relationship with the care team, as well as increase access to and the quality of care (Barbosa et al., 2016). Patient-reported outcomes have been used to improve symptom monitoring, therapeutic adherence, and patients' quality of life (QOL), and to decrease costs related to health care (Howell et al., 2017; Strasser et al., 2016). Patient-reported outcomes can include treatments and cancer-related symptoms (Kerrigan et al., 2020), and they allow for closer symptom monitoring. For example, the use of patient-reported outcomes can help to avoid conducting a retrospective summary with the care team (Baldwin et al., 2017). In addition, the use of digital tools to collect patient-reported outcomes for symptom monitoring positively affects data transmission, patient self-efficacy, and timeliness of

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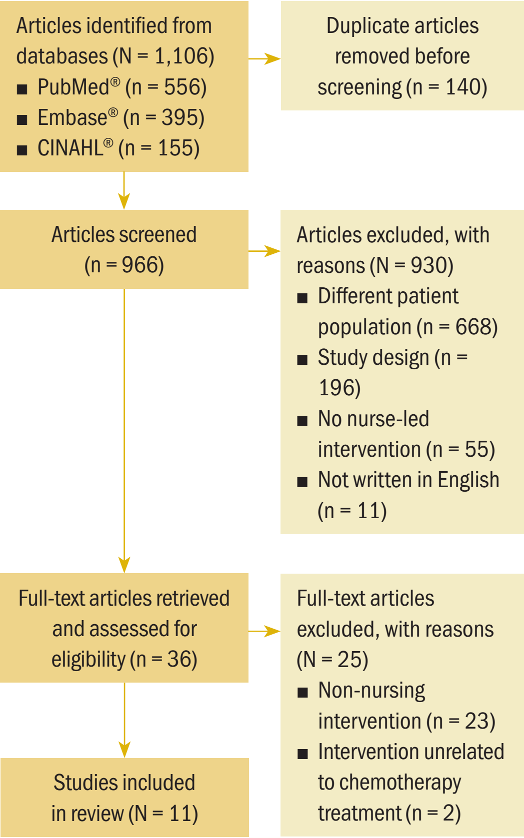
cancer treatment interventions (Warrington et al., 2019), thus improving patient–provider communication (Greenhalgh et al., 2018). The spread of eHealth, and telenursing in particular, can create challenges for nurses participating in different roles, such as therapeutic educational interventions, remote monitoring, and new interactions with patients and the care team (Allen et al., 2015).

In particular, a meta-analysis suggested that telemedicine (i.e., telehealth managed and delivered by physicians) and telenursing (i.e., telehealth managed and delivered by nurses) interventions had a positive impact on QOL and symptoms of anxiety and depression compared to usual care among patients with lung cancer (Pang et al., 2020). On-the-job education and training of nurses in this area should be provided by universities, scientific societies, and health organizations (Nittari et al., 2020). At the same time, international laws can be used to inform the national laws of different countries by sharing responsibilities among stakeholders (Ministry of Health, 2022).

FIGURE 1. PRISMA Flow Diagram



PRISMA—Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Purpose

The use of a telenursing model in patients with cancer receiving chemotherapy is a relatively new and broad development area for nurses. Knowledge of this field has yet to be extensively explored or developed using a broad study design to provide an overview of the topic (Harada et al., 2023). Therefore, the aim of the scoping review was to explore telenursing interventions, primary outcomes, and tools used in patients with cancer receiving chemotherapy.

Methods

Design and Research Questions

This scoping review was based on the methodologic guidance from JBI (Peters et al., 2020) and followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. In accordance with the scoping review guidance proposed in the JBI methodology (Peters et al., 2020; Tricco et al., 2016, 2018), the study was not registered. For the construction of the research strategy, the acronym PCC (population: patients with cancer receiving chemotherapy; concept: telenursing intervention; and context: hospital and home setting) was used. The research questions were as follows:

- What telenursing interventions are used to monitor patients with cancer receiving chemotherapy?
- What are the primary clinical outcomes?
- What are the main tools?

The first question investigated the primary international telenursing interventions used in patients with cancer. The second question examined the main clinical outcomes used within telenursing interventions in oncologic settings. The third question investigated the main quantitative tools used.

Inclusion Criteria

Studies including patients aged 18 years or older in the outpatient or homecare setting were eligible. All studies focused on telenursing interventions or involved nurses in education, prevention, and the treatment and management of patients receiving chemotherapy. The types of sources of evidence included primary studies (observational and experimental, including randomized and nonrandomized controlled trials), cohort studies, cross-sectional studies, case-control studies, qualitative studies, and mixed-methods studies written in English. For completeness, the researchers screened the reference lists

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of the excluded studies to find additional relevant studies to include in this scoping review. No limitations were used.

Exclusion Criteria

The exclusion criteria were patients aged younger than 18 years, interventions in which nurses were not included, and a hospital setting. Studies that were published in a language other than English or studies focused on healthcare professional perspectives, literature reviews, gray literature, protocol papers, or conference abstracts were also excluded.

Search Strategy

The authors consulted the following databases from January 1 to February 28, 2022: PubMed®, Embase®, and CINAHL®. For the construction of the search string, the main terms of interest were initially searched using free text. Based on the results obtained, the keywords with the highest results in each database were selected. MeSH (Medical Subject Headings) terms and free words for *telenursing*, *adverse event*, and *drug therapy* were identified and combined with Boolean operators AND and OR. Two experienced librarians (F.S. and V.S.) adapted the search strategy to the three databases.

Study Selection and Analysis

Relevant studies were assessed. As stated in the scoping review guidelines (Peters et al., 2020; Tricco et al., 2016, 2018), a critical appraisal of the individual studies included in this scoping review was not performed. The classification of the data produced a narrative synthesis of the results arising from the research questions, which enabled the drafting of this study.

The search led to the identification of 1,106 studies related to the use of telenursing interventions in patients with cancer receiving chemotherapy (see Figure 1). After excluding duplicates, the titles and abstracts were screened by two researchers. During the screening process, doubts were resolved with the agreement of the two researchers or with the support of a third researcher who supervised the study. The full text of relevant studies was read and led to the inclusion of nine studies (Absolom et al., 2021; Aranda et al., 2012; Basch et al., 2016; Børøsund et al., 2014; Innominato et al., 2016, 2018; Kearney et al., 2009; Mooney et al., 2017; Ream et al., 2015). Following a review of the reference lists of the included studies, two relevant studies were found (Coombs et al., 2020; McCann et al., 2009), which were secondary analyses of Mooney et al. (2017) and Kearney et al. (2009). Therefore, 11 studies were included in the final analysis.

Results

Characteristics of the Studies

In total, 2,189 outpatients or homecare patients with solid or hematologic cancers of varying stages participated in the 11 studies reviewed (Absolom et al., 2021; Aranda et al., 2012; Basch et al., 2016; Børøsund et al., 2014; Coombs et al., 2020; Innominato et al., 2016, 2018; Kearney et al., 2009; McCann et al., 2009; Mooney et al., 2017; Ream et al., 2015) (see Table 1). Eight randomized controlled trials (RCTs) (Absolom et al., 2021; Aranda et al., 2012; Basch et al., 2016; Børøsund et al., 2014; Coombs et al., 2020; Kearney et al., 2009; McCann et al., 2009; Mooney et al., 2017) compared an intervention group that received the telenursing intervention to usual care or enhanced usual care (control group). The three remaining studies were a pilot study (Innominato et al., 2018), an observational study (Innominato et al., 2016), and a mixed-methods study (Ream et al., 2015).

Telenursing interventions were mainly aimed at the prevention, management, and monitoring of chemotherapy-related symptoms, with educational purposes in the clinical pathway. Samples from individual studies ranged from 11 to 766 patients with varying cancer types. Although some studies provided only the average age of patients, the overall age range across all studies was 18–91 years. With the exception of two studies (Kearney et al., 2009; McCann et al., 2009), which reported results from the same study, all the studies were published in 2012 or later.

Single Study Characteristics

Innominato et al. (2016) assessed the acceptability of and adherence to a telemedicine platform for an average of 58 days (range = 38–313) among a sample of 31 patients with cancer. In the 30-day intervention interval, 95% of the sample transmitted their data at least once through the platform (830 of 874 patient days). The overall adherence rate was 59.7% (522 of 874 patient days), and the predictivity for urgent hospitalizations during the next three days was 94%. The worst outcome scores were regarding impacts on work ($\overline{X} = 5.1$) and activities of daily living ($\overline{X} = 4.9$), as well as fatigue, distress, and loss of appetite ($\overline{X} = 4.9$, 4.2, and 3.6, respectively).

In the study by Mooney et al. (2017), 358 patients with cancer receiving chemotherapy were

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TABLE 1. Data Extraction of Selected Studies (N = 11)

Study (Country)	Design, Setting, and Aim	Population, Timing, Tools, and Outcomes	Intervention and Nursing Implications
Absolom et al., 2021 (United Kingdom)	A randomized controlled trial comparing the effects of adding eRAPID (electronic patient self-Reporting of Adverse events: Patient Information and aDvice) to usual care versus usual care alone on symptom control, processes of care (admissions or chemotherapy delivery), patient self-efficacy, and global quality of life among outpatients in home care	■ Population: 508 patients with colorectal, breast, or gynecologic cancer (age range = 18–86 years) ■ Timing: 6, 12, and 18 weeks ■ Tools and outcomes: FACT-PWB (lack of energy, pain, nausea, bothersome side effects, feeling ill, spending time in bed, not meeting family needs); EQ-5D, EQ Visual Analog Scale, and EORTC QLQ-C30 scores; brief Cancer Behavior Inventory; Self-Efficacy Scale; and the Patient Activation Measure	Weekly or as needed based on severity of symptoms, patients in the intervention group completed an online symptom reporting tool for 18 weeks. Patients received weekly reminders to report symptoms and were given advice based on the severity of their symptoms. Nurses monitored daily symptoms and alerts sent via messaging or email.
Aranda et al., 2012 (Australia)	A randomized controlled trial of outpatients to evaluate psychological distress and secondary outcomes, including chemotherapy-related information, support needs, and symptom burden because of nausea, vomiting, infection, mucositis, fatigue, and hair loss	■ Population: 192 patients with nonmetastatic breast, gastrointestinal, or hematologic cancer ($\bar{X}$ age = 52.4 years) ■ Timing: at baseline and precycles 1 and 3 ■ Tools and outcomes: Eastern Cooperative Oncology Group Performance Status Scale, HADS, Cancer Treatment Survey (nausea, vomiting, infection, mucositis, fatigue, and hair loss), and the Chemotherapy Symptom Assessment Scale	Nurses led a prechemotherapy educational intervention. Patients received self-care information, educational counseling 24 hours or more before the first treatment, telephone follow-up 48 hours after the first treatment, and a face-to-face intervention immediately before the second treatment.
Basch et al., 2016 (United States)	A randomized controlled trial comparing web-based self-reporting of symptoms versus usual care to enhanced symptom monitoring for cancer treatment through patient-reported outcomes and assessing emergency department visits, hospitalizations, and survival among outpatients	■ Population: 766 patients with metastatic breast, genitourinary, gynecologic, or lung cancer (age range = 26–91 years) ■ Timing: at baseline and 6 months ■ Tools and outcomes: EQ-5D (mobility, self-care, usual activities, pain and discomfort, and anxiety and depression); 1-year survival; and the 5-point Symptom Tracking and Reporting scale based on the CTCAE (appetite loss, constipation, cough, diarrhea, dyspnea, dysuria, fatigue, hot flashes, nausea, pain, neuropathy, and vomiting)	Weekly symptom reports were requested by email and uploaded to Symptom Tracking and Reporting. Nurses received alerts about severe or worsening symptoms and carried out interventions as needed. Clinicians monitored symptoms during visits.
Børøsund et al., 2014 (Norway)	A randomized controlled trial comparing IPPCs, WebChoices, and usual care to assess the efficacy and effects of digital support added to usual care on symptom discomfort, anxiety, depression, and self-efficacy among outpatients	■ Population: 167 patients with breast cancer (age range = 31–79 years) ■ Timing: at baseline and 2, 4, and 6 months ■ Tools and outcomes: baseline questionnaires, SCQ-19, Memorial Symptom Assessment Scale, HADS, and Cancer Behavior Inventory; primary outcomes were distress, anxiety, and depression; the secondary outcome was self-efficacy.	IPPCs supported patients in sending and receiving messages, and WebChoices supported symptom monitoring and included information about containing and self-managing toxicities, a diary, and communication with other patients. Nurses identified eligible patients, provided information, managed IPPCs, responded with suggestions, and involved physicians only when necessary.

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TABLE 1. Data Extraction of Selected Studies (N = 11) ***(Continued)***

Study (Country)	Design, Setting, and Aim	Population, Timing, Tools, and Outcomes	Intervention and Nursing Implications
Coombs et al., 2020 (United States)	A randomized controlled trial secondary analysis of Symptom Care at Home (N = 59) versus usual care (N = 67) among outpatients in home care to identify whether a remote symptom monitoring intervention resulted in improved adherence and benefits regardless of age	■ Population: 126 patients (n = 90 female and n = 36 male) aged 60 years or older with any cancer type ■ Timing: daily for 6 months ■ Tools and outcomes: demographic characteristics and type and stage of cancer collected at baseline; patient-reported symptoms (pain, fatigue, nausea and vomiting, fever, diarrhea, constipation, sleep disturbance, sore mouth, anxiety, and depressed mood) and severity using a symptom severity scale (1–10); and a decision support system	Patients reported daily symptoms and their severity to Symptom Care at Home every day. For moderate and/or severe symptoms, patients in the intervention group were contacted by oncology nurses who suggested symptom control strategies, whereas patients in the control group were asked to contact their oncologist.
Innominato et al., 2016 (France)	An observational study of outpatients in home care to assess patients' adherence to and the acceptability and clinical feasibility of a daily telemonitoring intervention	■ Population: 17 male and 14 female patients with any cancer type receiving multichemotherapy (age range = 35–91 years) ■ Timing: daily for 30 days and 30 additional days postintervention ■ Tools and outcomes: MDASI for daily self-assessment of 13 symptoms (pain, fatigue, nausea, sleep disturbance, distress, shortness of breath, memory problems, lack of appetite, drowsiness, dry mouth, sadness, vomiting, numbness or tingling) and 6 items to assess impact on ADLs; inCASA platform, connected with a body weight scale and a wrist accelerometer (rest–activity); WHO-PS score at baseline; Service User Technology Acceptability Questionnaire for patient satisfaction; and unstructured narrative interviews for nurses	Nurses monitored patients' daily symptoms to prevent severe toxicities. A touchscreen computer equipped with SARA software was connected to a body weight scale for obtaining weight and a wrist accelerometer for monitoring 24-hour heart rate, allowing patients to self-complete the MDASI questionnaire every morning. In cases of lack of data for more than 24 hours, nurses called patients to evaluate the necessary intervention (e.g., information, visit, hospitalization). Patient satisfaction was evaluated using the Service User Technology Acceptability Questionnaire at study completion.
Innominato et al., 2018 (France)	A pilot study of outpatients in home care to assess the effects of chemotherapy on patients' physiology, behavior, and symptoms (e.g., sleep–wake rhythm, patient-reported outcomes, weight change) and to compare continuous and repeated measurement of the most frequent symptoms	■ Population: 11 homecare patients (age range = 48–72 years) with advanced or metastatic colorectal (n = 5) or pancreatic (n = 6) cancer ■ Timing: daily for 30 days ■ Tools and outcomes: MDASI for daily self-assessment of 13 symptoms and 6 items to measure interference with ADLs (fatigue, insomnia, anorexia, pain, and interference with activity, work, or relationships and enjoyment of life); WHO-PS; rest–activity; inCASA platform with SARA software integrated with wrist scale, accelerometer, and a body weight scale	Nurses monitored patients' daily symptoms to prevent severe toxicity and provide remote support. Nurses checked the dashboard daily for patient data on body weight and rest–activity rhythm, calling the patient in case of inactivity for more than 24 hours or severe signs and symptoms. Nurses implemented the most appropriate intervention (e.g., educational intervention, reassurance, urgent visit, hospitalization).

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TABLE 1. Data Extraction of Selected Studies (N = 11) ***(Continued)***

Study (Country)	Design, Setting, and Aim	Population, Timing, Tools, and Outcomes	Intervention and Nursing Implications
Kearney et al., 2009 (United Kingdom)	A randomized controlled trial comparing ASyMS versus usual care in outpatients to assess the effect of ASyMS on the incidence, severity, and distress of 6 chemotherapy-related symptoms (nausea, vomiting, fatigue, mucositis, hand–foot syndrome, and diarrhea)	■ Population: 112 patients with lung, breast, or colorectal cancer ($\bar{X}$ age = 56 years) ■ Timing: at baseline and precycles 2–5 (days 1–14 and any time they felt unwell) ■ Tools and outcomes: CTCAE-based questionnaire (nausea, vomiting, fatigue, mucositis, hand–foot syndrome, and diarrhea); Chemotherapy Symptom Assessment Scale	Nurses trained patients in the use of ASyMS. Patients received automated information after entering a symptom into the system. Clinicians received alerts for clinically relevant symptoms and contacted patients as needed.
McCann et al., 2009 (United Kingdom)	A randomized controlled trial to evaluate perceptions of ASyMS versus usual care on cancer treatment–related adverse events among outpatients in home care	■ Population: 112 patients with lung, breast, or colorectal cancer ($\bar{X}$ age = 56 years) ■ Timing: baseline and precycles 2–5 ■ Tools and outcomes: pre-/postintervention perception questionnaires (n = 56 patients) and semistructured interviews (n = 12 patients)	Nurses trained patients in the use of ASyMS. Information entered by patients for the assessment of treatment-related symptoms generated real-time alerts at 2 levels. For moderate symptoms, patients received indications to alleviate symptoms, and for severe symptoms, health professionals contacted patients.
Mooney et al., 2017 (United States)	A randomized controlled trial comparing Symptom Care at Home versus usual care to assess the effectiveness of an electronic cancer treatment–related symptom control system among outpatients and symptom severity, as well as the number of severe, moderate, mild, and symptom-free days	■ Population: 358 patients ($\bar{X}$ age = 55.8 years) with breast or lung cancer ■ Timing: at baseline and daily for 6 months ■ Tools and outcomes: the severity of 11 symptoms (fatigue, trouble sleeping, nausea and vomiting, pain, numbness or tingling, feeling blue or down, feeling nervous or anxious, distress over appearance, diarrhea, sore mouth, and trouble thinking or concentrating) on a symptom severity scale; and a decision support system	All participants called the automated system and reported their experience with 11 symptoms following a reminder call. Only reports of severe symptoms for patients in the Symptom Care at Home group alerted the nurses, who subsequently contacted the patients to suggest the appropriate intervention.
Ream et al., 2015 (United Kingdom)	A mixed-methods exploratory study to evaluate reductions in fatigue intensity, and related suffering, self-efficacy, anxiety, and depression among outpatients using an adaptation of the Brief Fatigue Inventory for telephone delivery	■ Population: 44 patients with breast or colorectal cancer or lymphoma, with a mean age of 53.3 years (range = 47–64) ■ Timing: at baseline and the completion of chemotherapy ■ Tools and outcomes: Brief Fatigue Inventory, Fatigue Distress Scale, HADS, and brief health-specific self-efficacy scales (fatigue intensity, distress, and self-efficacy; anxiety and depression); motivational interviewing with semistructured interviews	Semistructured interviews conducted by nurses trained in motivational interviewing were used to investigate the usefulness of the intervention, its contribution to fatigue management, patient satisfaction, time spent, and the number of and intervals between calls.

ADLs—activities of daily living; ASyMS—Advanced Symptom Management System; CTCAE—Common Terminology Criteria for Adverse Events; EORTC QLQ-C30—European Organisation for Research and Treatment of Cancer Quality-of-Life Questionnaire–Core 30; EQ—Euro Quality of Life; FACT-PWB—Functional Assessment of Cancer Therapy–Physical Well-Being subscale; HADS—Hospital Anxiety and Depression Scale; inCASA—Integrated Network for Completely Assisted Senior Citizen's Autonomy; IPPCs—internet-based patient–provider communication services; MDASI—MD Anderson Symptom Inventory; SARA—Simulation Assisted Reliability Assessment; SCQ—Social Communication Questionnaire; WHO-PS—World Health Organization Performance Status

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randomized to enhanced usual care (N = 178) or Symptom Care at Home (SCH) (N = 180). Patients in the SCH group provided daily reports on the severity of 11 symptoms and received evidence-based suggestions from nurses to reduce their daily symptom burden. Patients receiving usual care called SCH without subsequently receiving nursing support or alerts. The SCH group reported lower symptom severity (p < 0.001) across all ages (p < 0.001), with high adherence in both groups (p = 0.8). Compared to usual care, SCH significantly reduced days with severe (p < 0.001) and moderate symptoms (p = 0.001) and improved mild (p = 0.016) and no symptom days (p = 0.006). In addition, except for diarrhea, SCH significantly reduced all symptom scores (p < 0.05).

In the secondary analysis by Coombs et al. (2020), 126 patients aged 60 years or older were randomized to the SCH (n = 59) or usual care (n = 67) group. Regardless of age, all patients in the SCH group had better symptom control than those in the usual care group (p < 0.001). Older adult patients in the SCH group experienced fewer severe and moderate symptoms than older adults in the usual care group (p = 0.03 and 0.004, respectively), and no differences were observed in mild and asymptomatic patients (p = 0.38 and 0.21, respectively).

Kearney et al. (2009) performed a two-group RCT using the Advanced Symptom Management System (ASyMS) at five time points (baseline, precycle 2, precycle 3, precycle 4, and precycle 5) with 112 patients with breast, colorectal, or lung cancer. Patients in the intervention group used an interactive voice response tool to receive tips on symptom management after completing their symptom assessment questionnaires. The results suggested no significant differences in both groups for monitoring symptoms, except for fatigue, which was higher in the control group (odds ratio = 2.29, 95% confidence interval (CI) [1.04, 5.05], p = 0.04), and hand–foot syndrome, which was lower in the control group (odds ratio = 0.39, 95% CI [0.17, 0.92], p = 0.031).

McCann et al. (2009) conducted a secondary analysis of the experience and perceptions of 56 patients in the intervention group of the Kearney et al. (2009) study. The patients' expectations of using ASyMS were globally positive regarding improving communication with the care team (87%), management of treatment-related symptoms (79%), and reassurance regarding toxicity alerts. One patient reported issues using ASyMS every day, whereas 36% of the sample reported rarely experiencing some issues. Semistructured interviews from 12 patients globally confirmed the positive experience detected by the study questionnaires (McCann et al., 2009).

Absolom et al. (2021) included 508 patients with cancer in their RCT, which compared the effects of usual care (n = 252) and eRAPID (electronic patient self-Reporting of Adverse events: Patient Information and aDvice) added to usual care (n = 256) on symptom control, self-efficacy, system usability, and QOL at 6, 12, and 18 weeks. For the primary outcome of physical well-being, patients in the intervention group reported significantly better physical well-being at 6 weeks ($\bar{X}$ difference = 1.08, 95% CI [0.12, 2.05], p = 0.028) and 12 weeks ($\bar{X}$ difference = 1.01, 95% CI [0.05, 1.98], p = 0.039) compared to patients in the usual care group. In addition, compared to usual care, the eRAPID arm reported better outcomes at 6 and 12 weeks, maintaining more extended physical well-being (39% versus 32%, respectively). Significant differences in QOL were reported between the eRAPID and usual care groups at 12 ($\bar{X}$ difference = 3.5, 95% CI [0.35, 6.66], p = 0.03) and 18 weeks ($\bar{X}$ difference = 4.48, 95% CI [1.11, 7.86], p = 0.009) but not at 6 weeks ($\bar{X}$ difference = 1.36, 95% CI [1.66, 4.49], p = 0.377). Self-efficacy improved at 18 weeks in the eRAPID arm ($\bar{X}$ difference = 0.48, 95% CI [0.13, 0.83], p = 0.007). There were no differences in healthcare resource usage or the Patient Activation Measure and brief Cancer Behavior Inventory scores. In the eRAPID arm, EuroQOL Visual Analog Scale scores improved at 12 and 18 weeks ($\bar{X}$ difference = 3.5, 95% CI [0.35, 6.66], p = 0.03, and $\bar{X}$ difference = 4.48, 95% CI [1.11, 7.86], p = 0.009, respectively) but not in the short term, with an average patient adherence rate of about 65%.

In a two-phase exploratory, mixed-methods study, Ream et al. (2015) described the effects of telephone motivational interviews delivered by oncology nurses on cancer-related fatigue and proactive behavior changes in complex situations. An in-depth fatigue assessment was conducted with 23 patients with cancer, 9 of whom participated in motivational interviews. For the 21 patients in the control group (usual care), no thorough screening for fatigue was performed. Except for anxiety, all variables improved in the intervention arm and worsened in the control arm, albeit with minor effect size. Seven of nine patients found benefit from the motivational interview, similar to the face-to-face intervention.

An RCT by Basch et al. (2016) randomized 766 patients into two groups: 539 computer-experienced patients and 227 computer-inexperienced patients. Both groups were subsequently randomized into

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the intervention (use of Symptom Tracking and Reporting) or control group (usual care). The primary outcome was health-related QOL, which was assessed at baseline and six months using the EuroQOL-5D. Secondary outcomes were related to hospitalizations, emergency department visits, and one-year survival. In the intervention group compared to the control group, health-related QOL improved in more patients (34% versus 18%), worsened in fewer patients (38% versus 53%, $p < 0.001$), and decreased less overall (1.4 versus 7.1, $p < 0.001$). In addition, in the intervention group compared to the control group, one-year survival (75% versus 69%, $p = 0.05$) and quality-adjusted survival ($\bar{X} = 8.7$ versus 8 months, $p = 0.004$) improved, and duration of chemotherapy ($\bar{X} = 6.3$ versus 8.2 months, $p = 0.002$), one-year emergency department access (34% versus 41%, $p = 0.02$), and hospitalizations (45% versus 49%, $p = 0.08$) decreased. In 77% of cases followed by nurse counseling, 63% of patients in the intervention group experienced major grade 3 symptoms. Computer-inexperienced patients obtained the most significant benefits from Symptom Tracking and Reporting.

Børøsund et al. (2014) used an RCT to compare three arms of patients with breast cancer: usual care (control group), an internet-based patient–provider communication service (IPPC), and a WebChoices intervention added to an IPPC on depression, anxiety, and symptom distress (primary end points) and self-efficacy (secondary end point), at two, four, and six months. IPPCs enable the exchange of information, questions, and experiences between patients and nurses. Clinicians are notified by nurses as needed. Improvements in scores for depression ($p = 0.03$), anxiety ($p = 0.03$), symptom distress over time ($p = 0.001$), and self-efficacy ($p = 0.08$) were best for WebChoices versus usual care, with no significant differences reported in the IPPC group. The IPPC group had better scores than usual care for depression ($p = 0.03$), with no significant differences for anxiety and distress.

Aranda et al. (2012) addressed the effects of an educational intervention using prechemotherapy education on distress, information and support needs, and symptom burden among 192 patients with cancer prior to and while receiving chemotherapy. The intervention group received an educational intervention from nurses to fill information needs, provide support for treatment-related fears and concerns, and promote self-efficacy before starting chemotherapy and subsequently before cycles 1 and 3. Patients in the usual care group received the educational intervention on the day of the first chemotherapy cycle. Prechemotherapy education did not significantly reduce distress but improved personal and treatment-related concerns and vomiting at all time points ($p = 0.027$, $p = 0.03$, and $p = 0.001$, respectively). In addition, among both patient groups with high distress at time 1, a significant reduction was observed at time 2.

Main Outcomes and Tools

Table 2 summarizes the primary outcomes and tools highlighted in this scoping review. Fatigue was assessed in 9 of 11 studies and was measured using specific tools, such as the Fatigue Distress Scale (Holley, 2000) and the Brief Fatigue Inventory (Mendoza et al., 1999), and nonspecific tools. Psychological distress and symptoms of anxiety and depression were assessed in nine studies using nonspecific and specific tools, such as the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983). Symptom burden was assessed in 10 studies. The main symptoms assessed in the studies were pain, nausea and vomiting, diarrhea, sleep disturbance, insomnia, loss of appetite, dizziness and tingling, hair loss, hand–foot syndrome, and mucositis. Different outcomes were used to describe patients' health status (e.g., performance status); the impact of care on patients' physical, psychological, and social well-being; burdens on the health system (e.g., hospitalizations, visits, emergency department use); and how decision-making, alerts, and interventions affected the care process. The main outcomes investigated were self-efficacy, QOL, performance status, perceived physical and psychological well-being and treatment-related distress, and activities of daily living, among others. Four studies (Innominato et al., 2016, 2018; McCann et al., 2009; Ream et al., 2015) also investigated the usability of and/or patient satisfaction with the intervention.

Tools were mainly administered at baseline, during the studies, and at the completion of the studies using validated tools, which patients accessed through web-based platforms, software, or telephone delivery. Specific tools used to measure symptom burden included the Memorial Symptom Assessment Scale (Portenoy et al., 1994), the MD Anderson Symptom Inventory (Cleeland et al., 2000), the Chemotherapy Symptom Assessment Scale (Brown et al., 2001), the Cancer Treatment Survey (Schofield et al., 2012), and generic tools based on the Common Terminology Criteria for Adverse Events. Table 3 describes the remote management systems used.

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TABLE 2. Tools Used to Evaluate Primary Outcomes in Selected Studies

Tool	Study
Anxiety and depression	
EQ-5D	Basch et al., 2016
FACT-G and FACT-PWB	Absolom et al., 2021
Hospital Anxiety and Depression Scale	Aranda et al., 2012; Børøsund et al., 2014; Ream et al., 2015
Symptom severity scale	Coombs et al., 2020; Mooney et al., 2017
Comorbidity	
Self-Administered Comorbidity Questionnaire	Børøsund et al., 2014
Distress	
MD Anderson Symptom Inventory	Innominato et al., 2018
Fatigue	
Brief Fatigue Inventory	Ream et al., 2015
Cancer Treatment Survey	Aranda et al., 2012
CTCAE-based scale	Basch et al., 2016; Kearney et al., 2009
FACT-PWB	Absolom et al., 2021
Fatigue Distress Scale	Ream et al., 2015
MD Anderson Symptom Inventory	Innominato et al., 2016, 2018
Symptom severity scale	Coombs et al., 2020; Mooney et al., 2017
Multisymptom patient-reported outcomes	
Chemotherapy Symptom Assessment Scale	Absolom et al., 2021; Aranda et al., 2012; Kearney et al., 2009
CTCAE-based scale	Basch et al., 2016; Kearney et al., 2009
MD Anderson Symptom Inventory	Innominato et al., 2016, 2018
Memorial Symptom Assessment Scale	Børøsund et al., 2014
Symptom severity scale	Absolom et al., 2021; Coombs et al., 2020; McCann et al., 2009; Mooney et al., 2017; Ream et al., 2015
1-year survival	
Social Security Death Index	Basch et al., 2016
Performance status	
ECOG Performance Status Scale	Aranda et al., 2012
World Health Organization Performance Status	Innominato et al., 2016, 2018
Quality of life	
EORTC QLQ-C30	Absolom et al., 2021
EQ-5D and EQ Visual Analog Scale	Absolom et al., 2021; Basch et al., 2016

Continued on the next page

TABLE 2. Tools Used to Evaluate Primary Outcomes in Selected Studies *(Continued)*

Tool	Study
Satisfaction	
Semistructured interviews	Innominato et al., 2016, 2018; McCann et al., 2009; Ream et al., 2015
Self-efficacy	
Brief health-specific self-efficacy scales	Ream et al., 2015
CBI and brief CBI	Børøsund et al., 2014
Self-Efficacy Scale	Absolom et al., 2021
System usability	
Perception questionnaires	McCann et al., 2009
SUTAQ	Innominato et al., 2016
Well-being	
Cancer Treatment Survey	Aranda et al., 2012
FACT-G and FACT-PWB	Absolom et al., 2021
Patient Activation Measure	Absolom et al., 2021
Rest–activity	Innominato et al., 2016, 2018

CBI—Cancer Behavior Inventory; CTCAE—Common Terminology Criteria for Adverse Events; ECOG—Eastern Cooperative Oncology Group; EORTC QLQ-C30—European Organisation for Research and Treatment of Cancer Quality-of-Life Questionnaire–Core 30; EQ—Euro Quality of Life; FACT-G—Functional Assessment of Cancer Therapy–General; FACT-PWB—Functional Assessment of Cancer Therapy–Physical Well-Being subscale; SUTAQ—Service User Technology Acceptability Questionnaire

Discussion

Technology-supported remote interventions can improve the well-being of patients with cancer and alleviate the burden of treatment (da Silva et al., 2022; Kwok et al., 2022). This is particularly important given the increased use of telemedicine and telenursing following the COVID-19 pandemic (Doraiswamy et al., 2020; Grasselli et al., 2020).

The purpose of this scoping review was to investigate the use of telenursing interventions in the management of patients with cancer receiving chemotherapy. The findings suggest that telenursing interventions were carried out using different study designs, objectives, outcomes, and tools. Eleven studies met the inclusion criteria, but the scoping review design and the studies' evident heterogeneity did not allow for a meta-analysis. In accordance with the literature (da Silva et al., 2022; Kwok et al., 2022), real-time monitoring can improve symptom management in the early phases of chemotherapy and disease stage (Absolom et al., 2021). Unlike other studies (Basch et al., 2016; Denis et al., 2019), no significant improvements were observed in patients with advanced disease (Absolom et al., 2021), but the small sample size and observation period may have underpowered the effects.

Following broad studies (Al Maqbali et al., 2021; Fabi et al., 2020; Frick et al., 2017; Ma et al., 2020), the current study's findings confirmed the impact of chemotherapy on fatigue, highlighting the frequency and importance of this symptom. The results for the burden of fatigue in the primary study using ASyMS (Kearney et al., 2009) could be because of the simplified and more accurate reporting from remote monitoring of this high-burden symptom, which has been commonly underscreened and underreported in clinical practice (Carrasco & Symes, 2018).

Within the limits of its exploratory nature, the study by Ream et al. (2015) assessed the effectiveness of a telephone version of the Brief Fatigue Inventory and motivational interviews compared to face-to-face delivery in managing fatigue. The findings suggest that

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nurses' skills, qualifications, and empathetic qualities play a key role in such interventions, influencing their success in managing cancer-related fatigue. However, the findings should consider the study's limitations and be tested through a powered RCT. Based on this review, the literature suggests that psychological distress, particularly anxiety and depression, has a high prevalence among patients with cancer, which can negatively affect QOL and survival (Absolom et al., 2021; Aranda et al., 2012; Basch et al., 2016; Børøsund et al., 2014; Coombs et al., 2020; Innominato et al., 2016, 2018; Mooney et al., 2017; Ream et al., 2015; Setyowibowo et al., 2022). The reported high prevalence of telenursing interventions for symptom assessment and monitoring during the care process emphasizes the importance of tailored interventions in decision-making to improve patient outcomes.

In their secondary analysis, Coombs et al. (2020) compared differences between the use of SCH versus usual care. Unlike some previous studies (Gordon & Hornbrook, 2018; Vaportzis et al., 2017), no statistically significant differences were observed when using digital technologies with older adults. These findings underscore the need for more effortless access to digital resources and the use of simple and inclusive tools for older adults with cancer, a large population among patients with cancer (Siegel et al., 2019).

Børøsund et al. (2014) found that web-based support systems positively affected the severity of symptoms of anxiety and depression (Leis et al., 2022) and symptom burden (Maguire et al., 2021; Ruland et al., 2013) among patients with cancer. The WebChoices intervention and IPPCs positively influenced the psychological well-being of patients with cancer, particularly by improving symptoms of anxiety and depression. Based on the high burden of depression in patients with cancer (Leis et al., 2022), these findings are promising and demonstrate cost-effectiveness. In addition, these findings show how technology can offer nurses many support systems and strategies in cancer care. Telephone support systems can be helpful and sufficient. However, a web-based platform promoting more continuous monitoring and virtual meetings through video calls and messaging can improve the patient care experience and be an effective alternative to face-to-face meetings, with low interference with the team workflow.

The attention to self-efficacy underlines its importance in self-care and proactivity of patients with cancer, improving their coping strategies, well-being, and QOL, as in other diseases and chronic conditions (Yun & Sim, 2021). Many studies have found improvement in clinical outcomes and control of symptoms with the use of patient self-reporting, shared decision-making between patients and clinicians (Kotronoulas et al., 2014; Kroenke et al., 2014), and nurse-led counseling (Fieux et al., 2020).

Despite initial concerns, patients found ASyMS helpful and straightforward in managing chemotherapy-related toxicities and improving clinicians' communication (McCann et al., 2009). Poor communication between the care team and patients represents one of the primary concerns of patients with cancer and is a cause of medication errors, particularly in transitional care (Dionisi et al., 2022; Liquori et al., 2022). Digital tools (Aapro et al., 2020) and telenursing interventions (Johnson et al., 2018) can improve communication, not only in the oncology setting but also in overall health care (Dionisi et al., 2021). However, some patients with cancer are not receptive to this type of care delivery (Wintheiser et al., 2022). The RCT by Basch et al. (2016) showed a reduction in emergency department visits and hospitalizations and an improvement in treatment duration, one-year survival, and quality-adjusted survival, which are promising findings for nursing contributions in cancer care.

Finally, this review suggests significant heterogeneity regarding the tools used to measure clinical outcomes. The most used tools to detect the impact of multisymptoms were a symptom severity scale (Absolom et al., 2021; Coombs et al., 2020; McCann et al., 2009; Mooney et al., 2017; Ream et al., 2015) and the Chemotherapy Symptom Assessment Scale (Absolom et al., 2021; Aranda et al., 2012; Kearney et al., 2009). Several validated tools were used to evaluate the effects of telenursing interventions on the study outcomes, strengthening the findings of the

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- Telenursing interventions can play a strategic role in the complex care pathways of patients with cancer by preventing and effectively managing symptoms, particularly fatigue, anxiety, and depression, and reducing patient burden.
- Patient-tailored prevention strategies, such as primary telenursing interventions, can help patients to manage fatigue, anxiety, and depression using specific, generic, and validated tools.
- Remote telenursing interventions can engage patients in a proactive approach to symptom management, increasing the quality and safety of care.

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TABLE 3. Remote Management Systems Used by Selected Studies

System	Study
ASyMS	McCann et al., 2009
Decision support system	Coombs et al., 2020; Mooney et al., 2017
eRAPID	Absolom et al., 2021
inCASA	Innominato et al., 2016, 2018
IPPCs	Børøsund et al., 2014
PRISMS	Kearney et al., 2009
Risk model[a]	Kearney et al., 2009; McCann et al., 2009
SARA software	Innominato et al., 2016, 2018
STAR	Basch et al., 2016
Symptom Care at Home	Coombs et al., 2020; Mooney et al., 2017

[a] For any concerning symptom reported

ASyMS—Advanced Symptom Management System; eRAPID—electronic patient self-Reporting of Adverse events: Patient Information and aDvice; inCASA—Integrated Network for Completely Assisted Senior Citizen's Autonomy; IPPCs—internet-based patient-provider communication services; PRISMS—Patient Remote Intervention and Symptom Management System; SARA—Simulation Assisted Reliability Assessment; STAR—Symptom Tracking and Reporting

individual studies. Patient satisfaction and system usability were assessed in only four studies using interviews and validated tools (Innominato et al., 2016, 2018; McCann et al., 2009; Ream et al., 2015). This may represent a lack of important feedback to overcome patients' and healthcare professionals' barriers to the use of these tools in cancer care.

Limitations

This scoping review has some limitations. First, a scoping review does not have the methodologic rigor of a systematic review. Only studies in English, which is considered the common language used by the international scientific community, were included in this review because a lack of fluency in other languages limited the authors' ability to review additional studies. However, this may have excluded eligible studies written in languages other than English. Given the lack of quality assessment of the included studies, the implications for clinical practice and generalizations must consider this gap. In addition, many studies included small samples, partial data loss affecting the results, high dropout rates, the use of nonspecific symptom detection tools, and heterogeneous cancer populations, and some studies took place at only a single institution.

Implications for Nursing

Preventing and managing chemotherapy toxicities is an important nursing focus (De Leo et al., 2021). Nurses can help to prevent and manage adverse events among patients with cancer receiving chemotherapy, particularly cancer-related fatigue, anxiety, and depression. Remote telenursing interventions and electronic patient-reported outcomes for treatment-related toxicities can promote a preventive and proactive approach in patients with cancer, increasing the safety and quality of care and reducing burdens on patients, caregivers, and health systems (Ebrahimabadi et al., 2021; Sato, 2020; Shohani et al., 2018).

The use of telenursing interventions by oncology nurses with the proper skills, qualifications, and empathetic abilities can play a strategic role in the complex therapeutic pathways of patients with cancer and improve clinical and organizational outcomes. In addition, patients without transportation, those living in remote areas, or those with disabilities or little social support could benefit more from a wider availability of telenursing interventions and services. Support from healthcare organizations and best-practice strategies are needed to implement more meaningful telenursing interventions and evenly distribute the increase in care-related costs that this approach may entail.

Conclusion

Cancer and its treatments have a significant impact on patients' QOL and on healthcare organizations overall (World Health Organization, n.d.). Patient self-efficacy and prevention and management of cancer-related toxicities and treatments are needed to ensure the well-being of patients and sustainability of health systems (Howell et al., 2017). The use of patient-reported outcomes, eHealth, and telenursing interventions can provide a more objective and systematic approach to monitoring toxicities and symptom distress (Harada et al., 2023) and increase early clinical interventions for their reduction. This review suggests the importance of tailored patient prevention strategies and healthcare professionals' involvement and support in managing treatment-related toxicities to promote patient adherence and QOL (Absolom et al., 2021). An interprofessional approach to symptom management, including the contribution of oncology nurses and

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proactive patient involvement, can improve the prevention, identification, assessment, and management of symptoms (De Leo et al., 2021). In addition to managing, preventing, and monitoring fatigue, examining psychological distress, anxiety, and depression using specific and nonspecific tools may represent a critical element in the clinical pathway of patients with cancer. Implementing telenursing interventions based on the experiences and satisfaction of patients and nurses can help to overcome stakeholder barriers to using these tools.

The implementation of telenursing interventions should consider the organizational, professional, and instrumental resources available; digital health literacy; and the involvement of the interprofessional team, patients, and caregivers (Ferrua et al., 2020). The current review identified 11 studies focused on outpatients and patients in homecare settings; future studies on the use of telenursing interventions are needed to evaluate their effectiveness in acute or primary care. It may be useful to investigate whether personalized baseline educational prechemotherapy telenursing interventions produce better outcomes based on patients' needs. More significant support, even during treatment, could then be reserved for patients with higher distress or greater care needs. In addition, future research can investigate the nursing competencies and skills needed to promote the efficacy of telenursing interventions in patients with cancer. The generalization of the results of the current review and the efficacy of telenursing interventions on clinical outcomes in patients with cancer can be evaluated in different populations and settings to improve engagement among patients and healthcare providers. Finally, future studies can compare the effectiveness of the different tools through more rigorous studies and qualitative studies of remote care.

Aurora De Leo, MSN, RN, is a PhD student in the Department of Biomedicine and Prevention at Tor Vergata University of Rome and a member of the nursing research unit at the IRCCS Istituti Fisioterapici Ospitalieri in Rome; **Gloria Liquori, MSN, RN,** is a PhD student in the Department of Biomedicine and Prevention at Tor Vergata University of Rome; **Sara Dionisi, PhD, RN,** is a nurse in the Nursing, Technical and Rehabilitation Department at DaTeR Azienda Unità Sanitaria in Bologna; **Fabrizio Petrone, MSN, RN,** is the director of the Nursing, Technical, Rehabilitation, Assistance and Research Direction at the IRCCS Istituti Fisioterapici Ospitalieri; **Alessandro Spano, MSN, RN,** and **Nicolò Panattoni, MSN, RN,** are PhD students in the Department of Biomedicine and Prevention at Tor Vergata University of Rome and members of the nursing research unit at the IRCCS Istituti Fisioterapici Ospitalieri; **Noemi Giannetta, PhD, RN,** is an assistant professor of nursing science in the School of Nursing at UniCamillus-Saint Camillus International University of Health and Medical Sciences in Rome; and **Marco Di Muzio, PhD, RN,** is an assistant professor of nursing and **Emanuele Di Simone, PhD, RN,** is a research fellow in nursing sciences, both in the Department of Clinical and Molecular Medicine at Sapienza University of Rome, all in Italy. De Leo can be reached at aurora.deleo1975@gmail.com, with copy to ONFEditor@ons.org. (Submitted May 2023. Accepted August 17, 2023.)

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