ONLINE EXCLUSIVE ARTICLE

Effects of Nurse-Led Telephone-Based Supportive Interventions for Patients With Cancer: A Meta-Analysis

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Problem Identification: To evaluate the effects of nurse-led telephone-based supportive interventions (NTSIs) for patients with cancer.

Literature Search: Electronic databases, including EMBASE®, MEDLINE, Google Scholar, Cochrane Library CENTRAL, ProQuest Medical Library, and CINAHL®, were searched through February 2016.

Data Evaluation: 239 studies were identified; 16 were suitable for meta-analysis. Cochrane's risk of bias tool and the Comprehensive Meta-Analysis software were used.

Synthesis: The authors performed a meta-analysis of 16 trials that met eligibility criteria. Thirteen randomized, controlled trials (RCTs) and three non-RCTs examined a total of 2,912 patients with cancer. Patients who received NTSIs were compared with those who received attentional control or usual care (no intervention).

Conclusions: Telephone interventions delivered by a nurse in an oncology care setting reduced cancer symptoms with a moderate effect size (ES) (–0.33) and emotional distress with a small ES (–0.12), and improved self-care with a large ES (0.64) and health-related quality of life (HRQOL) with a small ES (0.3). Subgroup analyses indicated that the significant effects of NTSIs on cancer symptoms, emotional distress, and HRQOL were larger for studies that combined an application of a theoretical framework, had a control group given usual care, and used an RTC design.

Implications for Research: The findings suggest that an additional tiered evaluation that has a theoretical underpinning and high-quality methodology is required to confirm the efficacy of NTSI for adoption of specific care models.

Despite improvements in long-term prognosis, cancer survivors often have unmet supportive care needs because of the multimodal nature of cancer treatment (Hodgkinson, Butow, Hobbs, & Wain, 2007). Watchful monitoring of physical, psychological, and social well-being may help patients during the treatment and recovery processes. Therefore, patients may need supportive follow-up and other interventions as they progress through treatment and recovery. There are increasing efforts to design more efficient, cost-effective, and standardized care pathways to improve patients' health-related quality of life (HRQOL) (Asadi-Lari, Tamburini, & Gray, 2004). Such methods must be effective in improving and sustaining patient outcomes in cancer care settings. One major method is the use of nurses as care coordinators (Cruickshank, Kennedy, Lockhart, Dosser, & Dallas, 2008).

Many countries only have treatment services in a few major cities, and access to professional clinical and supportive services for people in regional and remote areas is a challenge. Telephone counseling can provide access to people in remote areas and has, therefore, become a standard method of providing education and advice to patients with cancer and other diseases (Greenberg,

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2000; Ridsdale et al., 2001). It generally is believed that telephone interventions hold promise for extending the supportive care provided to patients with cancer (Lewis et al., 2009; Montgomery, Krupa, Wilson, & Cooke, 2008).

Increasing evidence shows that nurse-led telephone-based supportive interventions (NTSIs) are an effective care delivery model. In particular, NTSIs can provide symptom management, informational support, follow-up, psychological and/or social support, lifestyle changes, sexual adjustment, health education, and tailored coaching, and they can improve HRQOL (Allard, 2007; Badger et al., 2005; Beaver et al., 2017; Beaver, Twomey, Witham, Foy, & Luker, 2006; Chambers et al., 2014, 2015; Coleman et al., 2005; Heiney et al., 2003; Kim et al., 2011; Kimman et al., 2011; Sandgren & McCaul, 2007; Schneider, Adams, & Gosselin, 2014; Sherman et al., 2012; Smits et al., 2015; Traeger et al., 2015; Young et al., 2013). However, the effects of NTSIs vary by study. Previous trials on the effect of follow-up for physical, psychological, and social care showed no significant effects on psychological distress or HRQOL (Beaver et al., 2017; Kimman et al., 2011; Smits et al., 2015; Young et al., 2013), or satisfaction with care needs (Smits et al., 2015; Young et al., 2013). More specifically, trials on the effect of psychological support showed no significant effect on psychological adjustment (Chambers et al., 2014), cancer-related psychosocial distress (Coleman et al., 2005), and distress about treatment side effects (Sherman et al., 2012). A trial that examined the effect of patient education on improving the understanding of cancer and treatment and management of side effects and lifestyle showed no significant effect on HRQOL and mood (Sandgren & McCaul, 2007). A trial of symptom management showed no significant effect on physical symptoms and associated distress (Traeger et al., 2015). A synthesis of these studies is needed to identify the reasons for the varying results, which could be related to differences in the control groups or conditions, intensity of interventions, characteristics of interventions, number or duration of sessions, intervals between sessions, or of group or individuals. Although previous interventions were implemented in different ways, the effect size (ES) of the different NTSIs must be considered.

Cox and Wilson (2003) reviewed 37 studies that examined the effect of nurse-led telephone-based (NT) follow-ups and concluded that NT follow-up services were acceptable and effective. However, the review was restricted to follow-up interventions, and included nonexperimental studies as well as experimental studies. In addition, no quantitative data synthesis was conducted for the 37 studies. Lewis et al. (2009) conducted a systematic review of four randomized, controlled trials (RCTs) that examined nurse-led follow-up of patients with cancer. The authors reported no significant differences in psychological morbidity, although contradictory results were noted regarding HRQOL and patient satisfaction. The reasons for the conflicting results must be addressed. Although many studies reported no statistically significant differences between the intervention and control groups, this does not necessarily mean that the interventions were ineffective and that the groups had equivalent outcomes. Identification of the source of variance is needed to detect differences in outcome among different studies; healthcare providers need to identify the strategies that make interventions more effective.

The controversy regarding the benefit of NTSIs can be resolved by a formal synthesis of these disparate studies, with consideration of their strengths and weaknesses. The specific aims of the current study were to synthesize the evidence for the effect of NTSIs on patients with cancer and provide a robust estimate of the size of their effect on cancer symptoms, emotional distress, self-care, adjustment, HRQOL, and patient satisfaction, and to identify the possible reason(s) for the heterogeneous results of previous studies by use of subgroup analysis.

Methods

The review procedure was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Liberati et al., 2009). All included studies were RCTs or non-RCTs, included adults aged 18 years or older who were diagnosed with cancer, and compared NTSIs with other healthcare provider- or peer-led interventions or usual care.

Data Sources and Searches

The search strategy was developed in collaboration with an experienced research librarian. The search strategy was (“Neoplasms” OR “CANCER”) AND (“Nurse” OR “Professional”) AND (“telephone” OR “phone”) AND (“intervention” OR “trial” OR “controlled trial” OR “experimental study” OR “quasi-experimental study”). Articles were identified by searches of MEDLINE, EMBASE®, Google Scholar, Cochrane Library Central, ProQuest Medical Library, and CINAHL® without search limits. The authors also performed manual reviews of reference lists in studies extracted from these databases. All searches included studies published in English or Korean from January 1996 to February 2016.

Study Selection

All RCTs and non-RCTs of NTSIs for patients were included. In all studies, supportive interventions

TABLE 1. Descriptive Summary of Included Studies

Study	Design	Control Arm	NTSI
Allard, 2007 (Canada)	RCT of 117 patients with breast cancer	Usual care (perioperative teaching by a nurse and one telephone call from a nurse)	Attentional focus and symptom management intervention
Badger et al., 2005 (United States)	Non-RCT of 48 patients with breast cancer	Usual care (six weekly calls from a nurse to inquire about general well-being and answer general questions)	Interpersonal counseling for symptom management and quality of life
Beaver et al., 2006 (United Kingdom)	Non-RCT of 135 patients with breast cancer	Usual care (routine hospital visits)	Intervention to meet informational needs
Beaver et al., 2017 (United Kingdom)	RCT of 259 patients with endometrial cancer	Usual care (routine hospital visits: one at 3 months, one at 6 months, or annual follow-up)	Follow-up (physical, psychological, and social care)
Chambers et al., 2014 (Australia)	RCT of 354 patients with mixed types of cancer	Psychologist-delivered telephone-based cognitive behavioral intervention (five sessions)	Low-intensity psychological support and education (self-management)
Chambers et al., 2015 (Australia)	RCT of 189 patients with prostate cancer	Usual care (standard medical management and a set of education materials) or peer-delivered telephone intervention (based on shared personal experience)	Counseling for sexual adjustment
Coleman et al., 2005 (United States)	RCT of 106 patients with breast cancer	Attentional educational materials via mailed resource kit	Social support and education to promote emotional and interpersonal adaptation and educational materials via mailed resource kit
Heiney et al., 2003 (United States)	RCT of 68 patients with breast cancer	Attendance of educational program and/or support groups within the community and access to national resources through Internet or media	Therapeutic group conference call
Kim et al., 2011 (South Korea)	RCT of 45 patients with breast cancer	No intervention	Stage-matched exercise and diet counseling
Kimman et al., 2011 (Netherlands)	RCT of 320 patients with breast cancer	Usual care (routine hospital visits)	Follow-up (screening for symptoms, treatment side effects, compliance with hormonal therapy, and open discussion)
Sandgren et al., 2007 (United States)	RCT of 218 patients with breast cancer	Usual care	Health education (understanding breast cancer and treatment, managing treatment side effects, healthy lifestyle, and follow-up review)
Schneider et al., 2014 (United States)	RCT of 48 patients with mixed types of cancer	Attentional chemotherapy education	Tailored adherence coaching
Sherman et al., 2012 (United States)	RCT of 122 patients with breast cancer	Usual care (hospital visit for disease management)	Psychoeducation (telephone counseling and disease management)
Smits et al., 2015 (United Kingdom)	Non-RCT of 296 patients with endometrial cancer	Usual care (routine hospital visits)	Follow-up (addressing physical symptoms, sexuality, practical issues, family concerns, emotional issues, and referral to the consultant clinic)

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TABLE 1. Descriptive Summary of Included Studies *(Continued)*

Study	Design	Control Arm	NTSI
Traeger et al., 2015 (United States)	RCT of 120 patients with mixed types of cancer	Usual care	Nursing guidance and support for symptom management and usual care
Young et al., 2013 (Australia)	RCT of 756 patients with colorectal cancer	Usual care (usual follow-up care)	Follow-up (care delivery model for providing supportive care, information, and emotional support)

NTSI—nurse-led telephone-based supportive intervention; RCT—randomized, controlled trial

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were conducted by nurses, and a telephone was the main means of intervention. A broad definition of supportive intervention was used so that all studies designed to help patients improve their physical and psychosocial outcomes were included. Therefore, studies that included psychological education, psychosocial support, informational support, follow-up, and consultation regarding sexual function, exercise, and diet were included. Studies of patients with metastatic, incurable, or terminal cancer were excluded. Studies were also excluded if they reported on mainly face-to-face interpersonal interventions that were supplemented with telephone-based interventions. Studies on screening and those that assessed decisions regarding treatment choice context were excluded.

All retrieved titles and abstracts were added to a reference management database. Studies were initially screened to ensure that they examined patients with cancer. Then, the titles and abstracts were independently screened in duplicate and, if necessary, the full texts were reviewed. A standardized data extraction form was used to screen the titles and abstracts of each manuscript to ensure initial eligibility and then to screen the full texts to ensure that they met the final criteria for eligibility. A third nurse-methodologist adjudicator resolved disagreements regarding eligibility and verified the studies selected. Pilot testing was performed on five studies by two independent reviewers before final data extraction. The Institutional Review Board at Kyungpook National University approved the study.

Data Extraction

The following data were extracted from each study: authors, year of publication, country of origin, type of cancer, study design, sample size, control conditions, intervention details (description of intervention, theoretical framework, timing of patient inclusion, number of sessions, intervention period, duration per session, and follow-up times), and outcomes (see Tables 1 and 2). The outcomes were cancer symptoms, emotional distress, self-care, adjustment, and sexuality.

Risk of Bias

RCTs and non-RCTs were independently assessed for methodologic quality by two researchers using the risk of bias tool developed by the Cochrane Bias Method Group (Higgins & Green, 2011). Each trial was evaluated according to four criteria (randomization-sequence generation, randomization concealment, blinding of data collectors, and blinding of outcome assessors), and each criterion was judged to have a high risk or low risk of bias. The risk of bias was assessed using Cochrane criteria (Effective Practice and Organisation of Care, 2016). The authors defined allocation concealment by use of random assignment by an independent staff member and concealment from intervention providers or research investigators, or by random assignment using a covered device (e.g., a sealed envelope). Blinding of the data collector was defined as performance of data collection before randomization, when different people performed data collection and random number generation, or when the study clearly reported that the data collector did not have information about assignment. Blinding of the outcome assessor was defined as use of different people as outcome assessors and intervention providers or research investigators, and outcome assessment was based on self-reported paper-based data, or sent and returned via mail, or when the study clearly reported that the outcome assessor did not have information about assignment. If a study was determined to have a high risk of bias for any one criterion, then it was considered to have a high risk of bias overall (Violette et al., 2015).

Statistical Analysis

The treatment and control groups were compared by calculation of standardized mean differences (SMDs) and 95% confidence interval (CIs). Means and standard deviations, frequencies, and percentages before and after the interventions were used for calculation of SMDs (i.e., Cohen's d) (Becker, 1988). Cohen's d of 0.8 was considered large, 0.5 was considered medium, and 0.2 was considered small (Cohen, 1988). A d value between 0–0.3 is a small effect size, between

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0.3–0.6 is a moderate effect size, and an effect size of greater than 0.6 is a large effect size. Each effect size was weighted by the inverse of its variance for calculating the SMD. This approach gives more weight to studies with larger sample sizes and reduces the imprecision of the pooled-effect estimate (Higgins & Green, 2011). The results across the studies were pooled using the DerSimonian-Laird random effects model, in which tau was estimated by the method of moments (DerSimonian & Laird, 1986). The authors assumed real differences among the studies as well as sampling errors and, therefore, conservatively used the random effects model. Subgroup analyses were conducted by dividing studies into groups according to application of a theoretical framework, control conditions, and study design. A meta-analysis for a particular outcome was conducted when data were available from at least two studies.

To assess potential publication bias, a funnel plot was used to display the effect size of each study relative to its deviation from the average effect. In the absence of bias, the plot should approximately resemble a symmetrical funnel. If there is bias (for example, because smaller studies without statistically significant effects remain unpublished), this will lead to an asymmetrical appearance of the funnel plot with a gap in a bottom corner of the graph (Higgins & Green, 2011). A complementary test of statistical significance for detecting publication bias was performed using Egger's linear regression intercept test (Egger, Smith, Schneider, & Minder, 1997). Meta-analysis was conducted using Comprehensive Meta-Analysis, version 3.0, software. A p value less than 0.05 was considered statistically significant, and all statistical tests were two-sided.

Findings

The authors initially identified 7,732 reports from the six databases. After screening of titles, abstracts, and full texts, 13 RCTs and 3 non-RCTs were selected for inclusion (see Figure 1). Eight studies were conducted in North America, and the others were conducted in Europe (Netherlands, United Kingdom), Australia, and South Korea. Ten reports were published since 2011. The mean age of study participants ranged from 45–70 years. The sample size of the 16 studies varied from 45–756, and the total number of patients was 2,912. The most common type of cancer was breast cancer (n = 9), followed by endometrial cancer (n = 2), prostate cancer (n = 1), colorectal cancer (n = 1), and multiple cancers (n = 3). The interventions of the enrolled studies were implemented at the time of diagnosis, after surgery, during or after adjuvant treatment, or after primary treatment.

Risk of Bias

The risk of bias, assessed using Cochrane criteria, indicated that 12 studies had high risk of bias and four had low risk of bias (see Table 3). All 13 RCTs adequately randomized the enrolled patients. The authors classified 4 trials as having adequate concealment, 11 trials as performing adequate blinding of data collectors, and 10 trials as performing adequate blinding of the outcome assessor. No trial reported whether the data analysts were blinded.

Description of Intervention and Control Conditions

The purposes of the trials were follow-up (Beaver et al., 2017; Kimman et al., 2011; Smits et al., 2015; Young et al., 2013), symptom management (Allard, 2007; Badger et al., 2005; Traeger et al., 2015), informational support (Beaver et al., 2006), psychological or psychosocial support (Chambers et al., 2014; Coleman et al., 2005; Heiney et al., 2003; Sandgren & McCaul, 2007; Sherman et al., 2012), sex therapy (Chambers et al., 2015), exercise and diet intervention (Kim et al., 2011), and coaching about self-care adherence (Schneider et al., 2014). The interventions from eight trials applied a theoretical framework. The interventions varied greatly in terms of the number and timing of the sessions. In particular, the number of sessions varied from 1–27, with a mean of 6.2, and the sessions varied from 2 weeks to 18 months in duration. The spacing of the interventions was regular, during the treatment phase, or mirrored the frequency of scheduled hospital visits for the control arm. The duration of each session was not reported in nine studies, and had no limitation or varied from 15–35 minutes in the other studies. The controls received attentional control (Coleman et al., 2005; Heiney et al., 2003; Schneider et al., 2014), peer- or psychologist-led intervention (Chambers et al., 2014, 2015), no intervention (Kim et al., 2011), or usual care. Thirteen of the 16 studies used more than two follow-up assessments.

Outcomes Considered

Previous researchers used diverse instruments to measure patient outcomes. The cancer symptoms evaluated were fatigue, altered sensation in the arm, lymphedema, constipation, diarrhea, dyspnea, nausea, vomiting, and other symptoms (n = 9). The emotional distress symptoms were anger, hostility, anxiety, depression, cancer-related worry, confusion, bewilderment, depression, dejection, loneliness, mood disturbance, negative affect, positive affect, and tension (n = 12). The adjustment symptoms were regulation of self-efficacy, avoidance coping, feelings of cancer, intrusive thinking and avoidance, medical

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TABLE 2. Descriptive Summary of Nurse-Led Telephone-Based Supportive Interventions

				Pretest Measure	Post-Test Measure			
Study	**Theoretical Framework**	**Time Frame**	**Period**	**Time 0**	**Time 1**	**Time 2**	**Time 3**	**Time 4**
Allard, 2007	Self-regulation theory	Between post-surgery and pre-adjuvant treatment	Two sessions for two weeks; no limitation on duration per session	Baseline (2–3 days after surgery)	9–10 days after surgery	17–18 days after surgery	–	–
Badger et al., 2005	Theories of interpersonal psychotherapy	After adjuvant treatment	Three sessions for six weeks; 32.9 minutes per session	Baseline	Immediately after intervention	One month after intervention	–	–
Beaver et al., 2006	–	Postsurgery	Two sessions in 8–12 months; no information was reported on session duration.	Baseline	3 months post diagnosis	8–12 months postdiagnosis	–	–
Beaver et al., 2017	–	After completion of primary treatment	One session (mirroring the frequency of scheduled hospital appointments for the control arm); session duration was 20 minutes.	Baseline	Immediately after telephone consultation	–	–	–
Chambers et al., 2014	–	For patients with heightened psychological distress	One session during a minimum of three weeks; no information was reported on session duration.	Baseline	3 months	6 months	12 months	–
Chambers et al., 2015	Cognitive-behavioral sex and couple therapy with an adult learning approach	Pre- or postsurgery	Six sessions (postsurgery recruitment) for 20 weeks, eight sessions (presurgery recruitment) for 22 weeks; no information was reported on session duration.	Baseline	3 months	6 months	12 months	–
Coleman et al., 2005	Roy adaptation model	Postsurgery	27 (phase 1 was weekly for two months, phase 2 was weekly for two months, phase 3 was twice per month for three months, and phase 4 was once per month for five months; no information was reported on session duration.	Baseline (2–4 weeks after surgery)	After phase 1 (three months postsurgery)	After phase 2 (five months postsurgery)	After phase 3 (eight months postsurgery)	After phase 4 (13 months postsurgery)

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TABLE 2. Descriptive Summary of Nurse-Led Telephone-Based Supportive Interventions *(Continued)*

Study	Theoretical Framework	Time Frame	Period	Pretest Measure	Post-Test Measure			
				Time 0	Time 1	Time 2	Time 3	Time 4
Heiney et al., 2003	Adapted version of Yalom's group intervention theory	Diagnosis within six months	Six sessions for six weeks; 15 minutes per session	Baseline	6 weeks	4 months	–	–
Kim et al., 2011	Transtheoretical model of change	Diagnosis within two years and after primary treatment	12 sessions for 12 weeks; 30 minutes per session	Baseline	12 weeks	–	–	–
Kimman et al., 2011	–	Completed breast cancer treatment within six weeks	Five sessions (mirroring frequency of scheduled hospital visits for control arm) for 18 months; no information was reported on session duration.	Baseline	3 months	6 months	12 months	18 months
Sandgren et al., 2007	–	After treatment (no particular time frame)	Six sessions (five weekly, then once at three months) for five months; health education was conducted for 35 minutes, and emotional expression lasted 31 minutes.	Baseline	6 months	13 months	–	–
Schneider et al., 2014	Reynolds adherence model	Within first week of starting oral chemotherapy	16 sessions weekly for the first month and then twice a month for six months; no information was reported on session duration.	Baseline	2 months	4 months	–	–
Sherman et al., 2012	Stress and coping model as well as the crisis intervention model	Diagnostic, postsurgery, adjuvant therapy, or recovery phases	One session at each of the following phases: diagnostic phase (one week), postsurgery phase (72 hours), adjuvant therapy phase (72 hours), and recovery phase (14 days); no information was reported on session duration.	Baseline	Within one week prior to surgery	Within 72 hours following surgery	Within 72 hours of discussion of adjuvant therapy	Within 14 days of completion of adjuvant therapy or six-month surgery anniversary date
Smits et al., 2015	–	After primary treatment	Three sessions (mirroring the frequency of scheduled hospital visits for the control arm) for one year; session duration was 15 minutes.	Baseline	One year after recruitment	–	–	–

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TABLE 2. Descriptive Summary of Nurse-Led Telephone-Based Supportive Interventions *(Continued)*

				Pretest Measure	Post-Test Measure			
Study	**Theoretical Framework**	**Time Frame**	**Period**	**Time 0**	**Time 1**	**Time 2**	**Time 3**	**Time 4**
Traeger et al., 2015	–	When initiating chemotherapy	Four sessions (two planned calls during the week after the first chemotherapy and two planned calls during the week after the second chemotherapy; no information was reported on session duration.	Baseline	Second visit	Third visit	–	–
Young et al., 2013	–	Postsurgery	Five sessions (3 and 10 days and then 1, 3, and 6 months after hospital discharge) for six months; no information was reported on session duration.	Baseline	3 months	6 months	–	–

self-efficacy, post-traumatic growth, and stress (n = 4). The HRQOL symptoms were functional well-being (i.e., cognitive, emotional, role, social, physical functioning, and functional status), overall well-being (i.e., physical, psychological, social, spiritual, and overall QOL), and relationship quality (i.e., relationship with the doctor) (n = 8). The patient satisfaction items were information needs met and satisfaction with information provided by healthcare providers (n = 5). Self-care was evaluated as adherence to medication or treatment and self-care (n = 2). Sexual outcome was evaluated in only one study (Chambers et al., 2015), so it could not be synthesized through meta-analysis.

Effect on Patient Outcomes

Table 4 shows the combined ES (i.e., SMD) of each trial and the ES of each trial according to cancer symptoms (n = 9), emotional distress (n = 12), self-care (n = 2), HRQOL (n = 8), adjustment (n = 4), and patient satisfaction (n = 5). The standardized ES of the 16 studies varied from 0.04 (95% CI [–0.24, 0.33]) for Smits et al. (2015) to 1.01 (95% CI [0.36, 1.67]) for Kim et al. (2011), with a weighted average of small effect size of 0.2 (95% CI [0.09, 0.3], $p < 0.001$). No significant heterogeneity was noted ($p = 0.128$, Q[15] = 21.3, $I^2 = 30\%$).

Cancer symptoms: Analysis of the nine studies that measured cancer symptoms indicated significant heterogeneity ($p = 0.004$, Q[8] = 22.5, $I^2 = 64\%$). However, when the authors pooled these nine studies, the group that received NTSIs had a significantly moderate ES on relief of cancer symptoms relative to the control group (weighted average ES: –0.33, 95% CI [–0.56, –0.1], $p = 0.005$).

Emotional distress: Analysis of the 12 studies that measured emotional distress indicated that, when these studies were pooled, the group that received NTSIs had a significant (but small) relief from emotional distress relative to the control group (weighted average ES: –0.12, 95% CI [–0.2, –0.04], $p = 0.005$). No significant heterogeneity was noted ($p = 0.872$, Q[11] = 6.1, $I^2 = 0\%$).

Self-care: For the two studies that measured self-care, the random effects estimate indicated a significantly large ES on improving self-care capability (weighted average ES: 0.64, 95% CI [0.05, 1.23], $p = 0.032$). No significant heterogeneity was noted ($p = 0.192$, Q[1] = 1.7, $I^2 = 41\%$).

Health-related quality of life: When the authors pooled the eight studies that measured HRQOL, the random effects estimate indicated a significant small ES on improving HRQOL (weighted average ES: 0.14, 95% CI [0.03, 0.25], $p = 0.016$). No significant heterogeneity was noted ($p = 0.315$, Q[7] = 8.2, $I^2 = 15\%$).

Adjustment: When the authors pooled the four studies that measured adjustment, no significant differences were noted between NTSI and control groups (weighted average ES: 0.3, 95% CI [–0.06, 0.67], $p = 0.102$). There was significant heterogeneity ($p = 0.003$, Q[3] =14.2, $I^2 = 79\%$).

Patient satisfaction: When the authors pooled the five studies that measured patient satisfaction, no significant

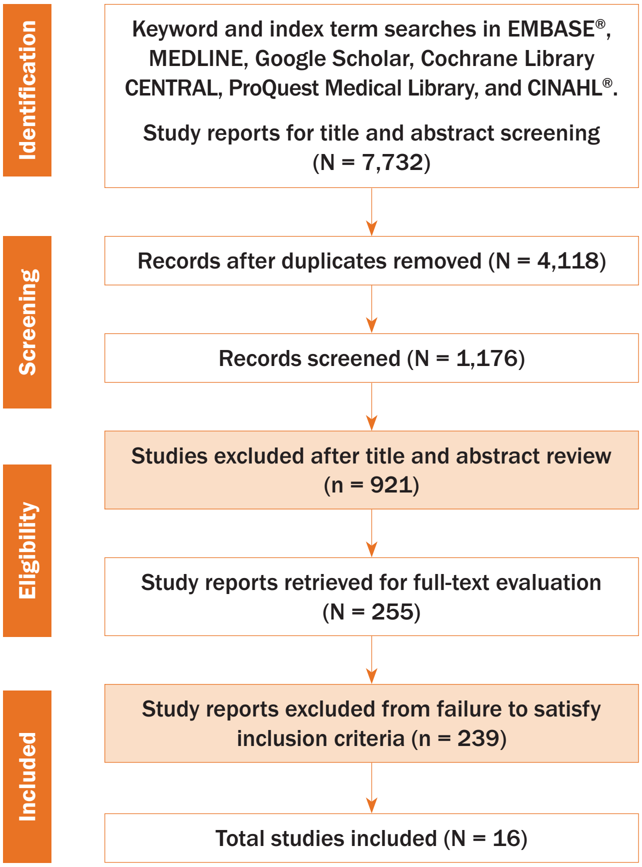

FIGURE 1. Selection of Studies

differences were noted between the NTSI and control groups (weighted average ES: 0.19, 95% CI [–0.03, 0.41], $p = 0.086$). No significant heterogeneity was noted ($p = 0.052$, Q[4] = 9.4, $I^2 = 58\%$).

Subgroup Analyses

The authors also performed subgroup analyses of studies that did or did not apply a theoretical framework, had different control conditions, and had different study designs (see Table 5). NTSIs had a significant effect on cancer symptoms when applying a theory-based intervention (weighted average ES: –0.4, 95% CI [–0.75, –0.05], $p = 0.026$), and used a control group that received usual care or no intervention (weighted average ES: –0.41, 95% CI [–0.7, –0.12], $p = 0.006$). NTSIs also had a significant effect on emotional distress when the control group received usual care or no intervention (weighted average ES: –0.11, 95% CI [–0.7, –0.12], $p = 0.006$), and in RCTs (weighted average ES: –0.11, 95% CI [–0.19, –0.02], $p = 0.012$). In addition, NTSIs had a significant effect on HRQOL when applying theory-based intervention (weighted average ES: 0.32, 95% CI [0.03, 0.62], $p = 0.033$), and when the control group received usual care or an intervention (weighted average ES: 0.14, 95% CI [0.002, 0.29], $p = 0.046$), and in RCTs (weighted average ES: 0.15, 95% CI [0.02, 0.29], $p = 0.028$).

Publication Bias

A funnel plot of all 16 studies (see Figure 2) was symmetric, with no evidence of potential publication bias. The results of Egger's regression test, an objective method used to assess publication bias, supports this conclusion (bias = 0.59, $t = 0.58$, $df = 14$, $p = 0.569$).

Discussion

The purpose of this meta-analysis was to provide an updated assessment of the effect of NTSIs on the outcomes of patients with cancer. Overall, NTSIs appeared to provide some important benefits. They were consistently effective in reducing cancer symptoms (moderate ES) and increasing self-care capability (large ES) and in reducing emotional distress and increasing HRQOL (small ES). However, they did not affect adjustment and patient satisfaction. The authors performed subgroup analysis to determine the reasons for the disparate results of the 16 included studies. This analysis indicated that the results regarding cancer symptoms, emotional distress, and HRQOL became stronger for studies with theoretical underpinnings and when a RCT design was used. In addition, the NTSIs had stronger effects when the controls were given usual care or no intervention. The findings are consistent with other reviews. For example, a review of the literature on NT follow-ups for cancer care suggested that this method provided patients with psychological support, and that the telephone was a suitable means of providing these services (Cox & Wilson, 2003). Another systematic review and meta-analysis of interventions for patients with psychological distress and physical illnesses suggested that nurse-led interventions significantly ameliorated psychological distress (Matcham et al., 2014). Additional research indicated that nurses' supportive attention and a sustained relationship through a one-nurse contact point may help satisfy patients' physical and psychological needs, and improve QOL (Moore et al., 2006; Pennery & Mallet, 2000).

The ESs of NTSIs on emotional distress and HRQOL were small. In addition, the NTSIs had no effect on patient satisfaction and adjustment. The authors surmise several possible reasons for these results. First, not using a theoretical framework may lead to a small ES. The subgroup analysis indicated that use of a theoretical framework to guide the aims of the interventions led to greater effects. In agreement, a previous systematic review and meta-analysis of interventions for psychological distress reported better outcomes for patients with depression when

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the approaches were based on a therapeutic model (Matcham et al., 2014). There is meta-analytical support for the ability of a theoretical framework to explain different health behaviors (Albarracin et al., 2005; Hagger, Chatzisarantis, & Biddle, 2002), and its usefulness as a basis for health interventions (Albarracin et al., 2005; Cohen, Gottlieb, & Underwood, 2001; Hardeman et al., 2002). It also is important that a theoretical framework be used in designing health messages (O'Keefe, 2012) and messages about health risks (Basil & Witte, 2012), and this includes use of appropriate emotional appeals (Turner, 2012), consideration of differences in health literacy (Chambers, Ferguson, Gardiner, Aitken, & Occhipinti, 2013; Jensen, 2012), and customizing messages for individuals with different stages of disease (Noar & Van Stee, 2012). When nurses communicate in the same manner to all patients, the benefits are not as great (Traeger et al., 2015; Young et al., 2013).

Second, methodologic issues may have diminished the size of effects and their statistical significance. The subgroup analysis showed that a RCT design yielded larger effects on reduction of emotional distress and improved HRQOL. Methodologic limitations of studies might bias the results toward a lack of effect or a strengthened effect (Higgins, Altman, & Sterne, 2011). More rigorous studies, such as RCTs, are more likely to yield reliable results. Another methodologic issue is that the time of outcome assessment may influence the ES and its significance. More specifically, the study that provided telephone intervention after one cycle of chemotherapy and assessed outcomes before starting the next cycle of chemotherapy (Traeger et al., 2015) assessed outcome when the symptom burden was lowest. Intervention effects may be weaker when assessed two to three weeks after chemotherapy. Therefore, the outcome of NTSIs for symptom management must be measured in a timely manner, such as when patients are suffering from chemotherapy-related side effects or when initiating recovery from chemotherapy.

Third, use of certain control conditions may influence the ES of the NTSIs. The authors found that NTSIs had a significant and moderate effect in nine trials that measured cancer symptoms (d = –0.33); however, the ES of seven trials in which the control group was "usual care" or "no intervention" was much larger (d = –0.41). NTSIs had no significant effects on cancer symptoms, emotional distress, and HRQOL when an attentional control group was used.

TABLE 3. Risk of Bias in Included Studies

Study	Random Sequence Generation	Allocation Concealment	Blinding of Data Collectors	Blinding of Outcome Assessors	Risk of Bias
Allard, 2007	Yes	No	Yes	Yes	High
Badger et al., 2005	No	No	No	No	High
Beaver et al., 2006	No	No	No	No	High
Beaver et al., 2017	Yes	No	Yes	Yes	High
Chambers et al., 2014	Yes	Yes	Yes	Yes	Low
Chambers et al., 2015	Yes	Yes	Yes	Yes	Low
Coleman et al., 2005	Yes	Yes	Yes	Yes	Low
Heiney et al., 2003	Yes	No	Yes	No	High
Kim et al., 2011	Yes	No	No	No	High
Kimman et al., 2011	Yes	No	Yes	Yes	High
Sandgren et al., 2007	Yes	No	No	No	High
Schneider et al., 2014	Yes	No	Yes	No	High
Sherman et al., 2012	Yes	Yes	Yes	Yes	Low
Smits et al., 2015	No	No	No	Yes	High
Traeger et al., 2015	Yes	No	Yes	Yes	High
Young et al., 2013	Yes	No	Yes	Yes	High

TABLE 4. Effect Size of NTSIs

Study	N	Variance	Z	Relative Weight	Standardized $\bar{X}$ Difference	95% CI	p
Combined effect of NTSI							
Allard, 2007	117	0.03	0.82	6.02	0.15	[−0.21, 0.51]	0.415
Badger et al., 2005	48	0.08	1.12	2.87	0.33	[−0.24, 0.9]	0.262
Beaver et al., 2006	135	0.06	2.79	4.14	0.66	[0.19, 1.12]	0.005
Beaver et al., 2017	259	0.05	0.61	4.28	0.14	[−0.31, 0.59]	0.545
Chambers et al., 2014	354	0.02	0.64	10.09	0.08	[−0.17, 0.33]	0.522
Chambers et al., 2015	125	0.06	0.97	3.98	0.23	[−0.24, 0.71]	0.331
Coleman et al., 2005	106	0.04	0.61	5.59	0.12	[−0.26, 0.5]	0.543
Heiney et al., 2003	66	0.05	1	3.79	0.25	[−0.24, 0.73]	0.317
Kim et al., 2011	45	0.11	3.04	2.25	1.01	[0.36, 1.67]	0.002
Kimman et al., 2011	299	0.01	0.94	11.05	0.11	[−0.12, 0.34]	0.347
Sandgren et al., 2007	125	0.04	1.76	5.57	0.34	[−0.04, 0.73]	0.078
Schneider et al., 2014	45	0.13	2.71	1.92	0.99	[0.27, 1.7]	0.007
Sherman et al., 2012	122	0.02	1.51	7.71	0.23	[−0.07, 0.54]	0.131
Smits et al., 2014	190	0.02	0.3	8.28	0.04	[−0.24, 0.33]	0.764
Traeger et al., 2015	120	0.03	0.74	6.14	0.14	[−0.22, 0.49]	0.459
Young et al., 2013	756	0.01	0.73	16.33	0.05	[−0.09, 0.2]	0.468
Random effects (subtotal)	2,912	0.003	3.74	–	0.2	[0.09, 0.3]	< 0.001
Cancer symptoms							
Badger et al., 2005	48	0.09	−1.89	8.51	−0.56	[−1.13, 0.02]	0.059
Beaver et al., 2006	135	0.09	−3.56	8.44	−1.05	[−1.64, −0.47]	< 0.001
Coleman et al., 2005	106	0.04	−0.36	12.17	−0.07	[−0.45, 0.31]	0.716
Heiney et al., 2003	66	0.06	−0.65	10.11	−0.16	[−0.64, 0.32]	0.517
Kim et al., 2011	45	0.11	−3.98	7.52	−1.31	[−1.95, −0.66]	< 0.001
Sandgren et al., 2007	125	0.03	−0.83	12.62	−0.51	[−0.51, 0.21]	0.406
Sherman et al., 2012	122	0.02	−1.51	13.81	−0.23	[−0.54, 0.07]	0.131
Smits et al., 2014	190	0.02	−0.61	14.16	−0.09	[−0.38, 0.2]	0.542
Traeger et al., 2015	120	0.03	−0.27	12.66	−0.05	[−0.11, 0.31]	0.783
Random effects (subtotal)	1,216	0.01	−2.81	–	−0.33	[−0.56, −0.1]	0.005
Emotional distress							
Allard, 2007	117	0.03	−0.59	5.04	−0.11	[−0.47, 0.25]	0.557
Badger et al., 2005	48	0.08	−0.89	2.05	−0.26	[−0.83, 0.31]	0.374
Beaver et al., 2006	135	0.03	−0.1	5.8	−0.19	[−0.53, 0.15]	0.27
Beaver et al., 2017	259	0.02	−0.07	11.18	−0.01	[−0.25, 0.24]	0.947
Chambers et al., 2014	354	0.02	−0.82	10.94	−0.1	[−0.35, 0.14]	0.411
Coleman et al., 2005	106	0.04	−0.86	4.55	−0.17	[−0.55, 0.21]	0.391

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TABLE 4. Effect Size of NTSIs *(Continued)*

Study	N	Variance	Z	Relative Weight	Standardized $\bar{X}$ Difference	95% CI	p
Emotional distress *(continued)*							
Heiney et al., 2003	66	0.06	−0.84	2.83	−0.21	[−0.69, 0.28]	0.402
Kim et al., 2011	45	0.1	−2.39	1.82	−0.74	[−1.34, −0.13]	0.017
Kimman et al., 2011	299	0.01	−0.85	12.9	−0.1	[−0.33, 0.13]	0.396
Sandgren et al., 2007	125	0.03	−0.42	5.14	−0.08	[−0.44, 0.28]	0.671
Traeger et al., 2015	120	0.03	−1.2	5.15	−0.22	[−0.58, 0.14]	0.229
Young et al., 2013	756	0.01	−1.18	32.6	−0.09	[−0.23, 0.06]	0.239
Random effects (subtotal)	2,430	0.002	−2.81	–	−0.12	[−0.2, −0.04]	0.005
Self-care							
Chambers et al., 2015	125	0.08	1.31	56.6	0.38	[−0.19, 0.95]	0.189
Schneider et al., 2014	45	0.13	2.71	43.4	0.99	[0.27, 1.7]	0.007
Random effects (subtotal)	170	0.09	2.14	–	0.64	[0.05, 1.23]	0.032
Adjustment							
Badger et al., 2005	48	0.08	0.57	18.55	0.17	[−0.4, 0.73]	0.567
Chambers et al., 2014	354	0.02	0.46	29.21	0.06	[−0.19, 0.3]	0.646
Kimman et al., 2011	299	0.01	0.95	29.81	0.11	[−0.12, 0.34]	0.342
Sandgren et al., 2007	125	0.05	4.39	22.44	1	[0.55, 1.44]	< 0.001
Random effects (subtotal)	826	0.03	1.64	–	0.3	[−0.06, 0.67]	0.102
Health-related quality of life							
Allard, 2007	117	0.03	1.04	8.57	0.19	[−0.17, 0.56]	0.297
Coleman et al., 2005	106	0.04	0.6	7.87	0.12	[−0.26, 0.5]	0.546
Heiney et al., 2003	66	0.06	1.51	4.97	0.38	[−0.11, 0.87]	0.131
Kim et al., 2011	45	0.13	2.75	2.43	1	[0.29, 1.71]	0.006
Kimman et al., 2011	299	0.01	1.02	18.97	0.12	[−0.11, 0.34]	0.308
Sandgren et al., 2007	125	0.03	0.82	8.74	0.15	[−0.21, 0.51]	0.415
Smits et al., 2014	190	0.02	0.96	12.76	0.14	[−0.15, 0.43]	0.335
Young et al., 2013	756	0.01	0.62	35.7	0.04	[−0.1, 0.19]	0.538
Random effects (subtotal)	1,704	0	2.42	–	0.14	[0.03, 0.25]	0.016
Patient satisfaction							
Beaver et al., 2006	135	0.05	3.3	15.47	0.72	[0.29, 1.15]	0.001
Beaver et al., 2017	259	0.09	0.9	10.11	0.27	[−0.32, 0.86]	0.369
Smits et al., 2014	190	0.02	0.55	22.86	0.08	[−0.21, 0.37]	0.584
Traeger et al., 2015	120	0.03	0.74	18.84	0.14	[−0.22, 0.49]	0.459
Young et al., 2013	756	0.01	0.39	32.72	0.03	[−0.11, 0.17]	0.7
Random effects (subtotal)	1,460	0.01	1.72	–	0.19	[−0.03, 0.41]	0.086

CI—confidence interval; NTSI—nurse-led telephone-based supportive intervention

Therefore, researchers and clinicians must employ appropriate control conditions so the effect of the intervention can be disclosed.

Fourth, patient age may influence the effect of NTSIs. The authors performed meta-regression to identify factors that potentially influenced outcomes. The results showed that the ES was significantly reduced as the mean age of the treatment and control groups was older (experimental group: coefficient = –0.017, p = 0.038; control group: coefficient = –0.018, p = 0.029). Older adult patients might have poorer health literacy and more serious or complicated health conditions (Halbach et al., 2016; Kobayashi, Wardle, Wolf, & von Wagner, 2015). In addition, because of age-related decline of cognitive function and physiological function, it may be more difficult for older adults to communicate with healthcare professionals and cope with cancer (Sparks & Nussbaum, 2008). However, the ES was unaffected by the number of sessions (telephone calls) (coefficient = 0.007, p = 0.456), intervention period (coefficient = –0.001, p = 0.631), or sample size (coefficient = –0.0004, p = 0.104). This finding is consistent with a previous review that examined psychosocial telephone interventions for patients with cancer (Okuyama, Jones, Ricklefs, & Tran, 2015). The enrolled interventions in the current meta-analysis varied greatly in frequency and period; some trials were short-term interventions (less than six weeks) (Allard, 2007; Badger et al., 2005; Heiney et al., 2003; Sherman et al., 2012), and some

TABLE 5. Effect Size for Nurse-Led Telephone-Based Supportive Interventions According to Subgroup Analyses

Category	Studies (n)	Standardized $\bar{X}$ Difference	95% CI	Z	p	I^2 (%)	Q	p
Cancer symptoms								
Application of theory								
Yes	5	−0.4	[−0.75, −0.05]	−2.2	0.026	67	12	0.017
No	4	−0.27	[−0.61, 0.07]	−1.6	0.121	69	9.6	0.022
Control condition								
Attentional control	2	−0.11	[−0.4, 0.19]	−0.7	0.493	–	0.1	0.777
Usual care or no intervention	7	−0.41	[−0.7, −0.12]	−2.8	0.006	72	21.3	0.002
Study design								
RCT	6	−0.26	[−0.52, 0.003]	−1.9	0.053	60	12.6	0.027
Non-RCT	3	−0.53	[−1.11, 0.06]	−1.7	0.081	78	9.2	0.01
Emotional distress								
Application of theory								
Yes	5	−0.23	[−0.43, −0.03]	−2.2	0.025	–	3.3	0.516
No	7	−0.1	[−0.18, −0.01]	−2.8	0.037	–	1.3	0.972
Control condition								
Attentional control	2	−0.18	[−0.48, 0.12]	−1.2	0.233	–	0.01	0.899
Peer- or psychologist-delivered	1	0.1	[−0.35, 0.14]	−0.8	0.411	–	0	1
Usual care or no intervention	9	−0.11	[−0.2, −0.02]	−2.5	0.014	–	5.8	0.67
Study design								
RCT	10	−0.11	[−0.19, −0.02]	−2.5	0.012	–	5.6	0.783
Non-RCT	2	−0.21	[−0.5, 0.08]	−1.4	0.161	–	0.04	0.841
Health-related quality of life								
Application of theory								
Yes	4	0.32	[0.03, 0.62]	2.1	0.033	40	5	0.172
No	4	0.08	[−0.02, 0.19]	1.5	0.125	–	0.7	0.882
Control condition								
Attentional control	2	0.22	[−0.09, 0.52]	1.4	0.16	–	0.7	0.413
Usual care or no intervention	6	0.14	[0.002, 0.27]	2	0.046	30	7.1	0.213
Study design								
RCT	7	0.15	[0.02, 0.29]	2.2	0.028	27	8.2	0.225
Non-RCT	1	0.14	[−0.15, 0.43]	0.9	0.335	–	0	1

CI—confidence interval; RCT—randomized, controlled trial

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trials were low-intensity and low-frequency interventions during long periods (once every three months) (Beaver et al., 2006, 2017; Kimman et al., 2011; Smits et al., 2015). Unfortunately, limited data were available on the duration of individual sessions. It appears that the effect of NTSIs cannot be properly evaluated because of the large variation in the intervention intensity and lack of information. Longer and more frequent sessions generally have a stronger effect on outcome, and are recommended by the authors of the enrolled trials (Faller et al., 2013; Rehse & Pukrop, 2003). In addition, patients did not receive all of the scheduled telephone calls from nurses. Therefore, for telephone-based interventions, complementary strategies, such as increased call frequency or duration, may be needed to facilitate contact, or a means should be provided for patients to contact nurses between scheduled calls (Traeger et al., 2015; Young et al., 2013).

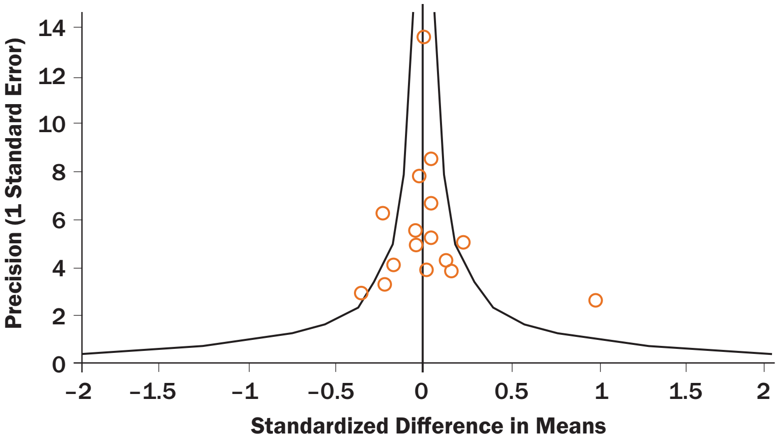

FIGURE 2. Funnel Plot of Study Precision Versus Standardized Difference in Means

The authors attempted to compare different types of NTSIs, such as those that focus on symptom management, informational support (health education), follow-up, psychosocial support, sexual adjustment support, group conference calls, and interventions regarding exercise and diet tailored to cancer stage. The authors examined 16 studies with direct comparisons, but there were too many different types of NTSIs to determine which type was most helpful. However, the authors found that informational support and tailored interventions led to improved patient outcomes; the former approach improved adjustment (Sandgren & McCaul, 2007), patient satisfaction (Beaver et al., 2006), and self-care capability (Schneider et al., 2014), and the latter approach reduced cancer symptoms and emotional distress, and improved HRQOL (Kim et al., 2011) and self-care capability (Schneider et al., 2014). Individuals with cancer need information about their disease and treatment, as well as advice about self-management after treatment (Rutten, Arora, Bakos, Aziz, & Rowland, 2005). Well-informed patients tend to have a higher mental QOL (Husson, Mols, & van de Poll-Franse, 2011), and may also have better clinical outcomes (Jefford & Tattersall, 2002). Therefore, informational support may have a positive influence on the outcomes of patients with cancer. An important aspect in supportive intervention is the need to determine the patients' perspectives and needs, preferences, level of emotional distress, and QOL so that NTSIs can be customized appropriately (Girgis, Breen, Stacey, & Lecathelinais, 2009; McLachlan et al., 2001). Patients require different types of care during the treatment, recovery, and rehabilitation phases.

Patients often use the Internet as a source of health information (Mathieu, 2010). Therefore, discussions on outcomes between telephone-based and web-based interventions are required. Several reviews have demonstrated some evidence in favor of web-based interventions for improving patient outcomes, including knowledge, healthy behavior, and social support (Murray, Burns, See, Lai, & Nazareth, 2005; Nguyen, Carrieri-Kohlman, Rankin, Slaughter, & Stulbarg, 2004; Paul, Carey, Sanson-Fisher, Houlcroft, & Turon, 2013; Ryhanen, Siekkinen, Rankinen, Korvenranta, & Leino-Kilpi, 2010). However, a web-based intervention only had a small positive effect on clinical outcomes, and did not have a positive effect on self-efficacy (Murray et al., 2005; Ryhanen et al., 2010).

A number of advantages exist for using web-based interventions rather than telephone-based interventions. In particular, a web-based intervention allows for real-time customization based on users' needs and preferences, and information can be presented in a range of formats, including text, graphics, and videos, according to the literacy level of the user, thereby improving understanding and recall (Smits et al., 2014). However, when using the telephone, information can be more customized to suit individual needs, and interactions on the telephone can incorporate more interactive features to facilitate communication and information sharing than is provided by email and online forums. The low use of Internet-based interventions remains challenging (Ryhanen et al., 2010). Telephone and web-based formats have different advantages and disadvantages, as well as different effects on outcomes. Therefore, further study of the effects of telephone- and web-based nurse-led or -developed supportive interventions is required.

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Strengths and Limitations

The strengths of the current study include the use of a comprehensive search, assessment of eligibility and data abstraction by independent researchers, appraisal of the risk of bias, and use of moderator analyses. There also were several limitations. First, although the authors implemented a rigorous protocol to identify eligible studies, it is possible that some publications were missed. In addition, the sample size was modest, and the risk of bias was high in 75% of the enrolled studies. Second, usual care likely varied among institutions, and this was not evaluable. Third, as noted in previous reviews (Young et al., 2013), there was substantial variability among the studies in the types of outcomes measured. These outcomes included global assessments, such as HRQOL, and more targeted assessments of depression, anxiety, and cancer-specific distress. The lack of standardization in outcome measures makes it challenging to compare studies. To account for limitations, the authors calculated standardized mean differences to pool study results.

Implications for Nursing

Oncology nurses often have more opportunity than other healthcare providers to develop a rapport with patients, and this is essential for effective interventions. Such interventions include helping patients to cope with long-term adjustments, emotional distress, and physical symptoms, and improving patients' HRQOL, self-care, and satisfaction with care so they can recover. Successful management of symptoms is recognized as a basic nursing intervention that is needed to improve a patient's sense of control and motivation for self-care. The interventions used in nursing are designed to help patients acquire vital knowledge so they can participate in their own self-care and engage in life activities. This study indicates that NTSIs provide successful management of symptoms and self-care, domains in which nurses excel. However, NTSIs seems to have smaller effects on emotional distress and HRQOL, and no significant effect on adjustment and patient satisfaction. A tiered evaluation that has a theoretical underpinning and high-quality methodology, and that considers individual patient characteristics (age, learning needs, psychological state, capabilities, learning style, and health literacy) is required to confirm the efficacy of NTSIs for adoption of specific care models to achieve various outcomes. This is a priority for nursing research, and the field of oncology nursing should continue to evolve as treatments for cancer evolve. As the number and survival rates of patients with cancer increases, follow-up care must further emphasize patient empowerment, so patients take more responsibility for their own care—an intervention that can be implemented via NTSIs (Ferrell, McCabe, & Levit, 2013).

Knowledge Translation

- **Nurse-led telephone-based supportive interventions can improve the care of patients with cancer by relieving symptoms and emotional distress and improving self-care and health-related quality of life. However, the overall effects on these outcomes were small.**
- **The effects of the telephone interventions were greater in studies that used a theoretical framework and had a randomized, controlled design.**
- **For a stronger and more effective care model, the treatment protocol should have an underpinning theory and high-quality methodology, and care should be tailored to patients' individual characteristics in oncology care settings.**

Conclusion

The findings of the current meta-analysis of the effect of telephone-based nursing care on patients with cancer suggest that telephone interventions delivered by nurses in the continuum of care appear to provide some important overall benefits. These interventions consistently ameliorate physical symptoms and emotional distress, and improve self-care and HRQOL. However, they did not affect adjustment and patient satisfaction. Subgroup analysis indicates that informational support delivered via telephone improved adjustment and patient satisfaction, emphasizing the importance of providing important information to patients. When studies that had an RCT design with theoretical underpinnings were used to examine this issue, the results regarding cancer symptoms, emotional distress, and HRQOL were stronger. Therefore, the traditional protocols and methodologies used for previous NTSIs may require modification to provide further benefits to patients with cancer.

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