A Nursing Intervention for Reducing Symptom Burden During Chemotherapy

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OBJECTIVES: To evaluate the efficacy of an individually tailored nursing intervention for reducing chemotherapy-related symptom distress in adult patients with cancer.

SAMPLE & SETTING: A control group (n = 71) received usual care and an intervention group (n = 72) received usual care and the CHEMO-SUPPORT intervention, all at the University Hospitals of Leuven in Belgium.

METHODS & VARIABLES: The intervention effect was evaluated by measuring the difference in outcomes between the two groups. The primary outcome, overall symptom distress, and other symptom-related outcomes were self-reported at the start of treatment (baseline) and at 3, 6, and 12 weeks.

RESULTS: The CHEMO-SUPPORT intervention showed significantly less worsening of overall symptom distress and severity. Self-efficacy and outcome expectations (measured at six weeks) were significantly higher in the intervention group. Self-care (measured at 12 weeks) was statistically similar between the two groups. The results emphasize the importance of nurses in coaching patients to adequately self-manage their symptoms at home.

IMPLICATIONS FOR NURSING: Providing goal-directed self-management support using motivational interviewing as well as tailoring are promising areas for reducing chemotherapy-related symptom distress.

KEYWORDS chemotherapy; nursing intervention; self-management; symptom management

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Although the evidence is unequivocal of a negative effect on quality of life from patients experiencing multiple concurrent symptoms associated with cancer treatment (Lowery et al., 2014), adequate symptom management and supportive care for patients remain a challenge in delivering cancer care. In the ambulatory setting, treatment side effects are commonly experienced in the absence of professional assistance (Ruland et al., 2013). However, evidence suggests that patients self-manage their symptoms poorly and that their communication of symptoms and supportive care needs to healthcare professionals is suboptimal (Clover, Kelly, Rogers, Britton, & Carter, 2013; Coolbrandt et al., 2011, 2013, 2015; Given et al., 2010; Pedersen, Koktved, & Nielsen, 2012).

Various nursing interventions, including coaching, telephone follow-up, and/or home care, have been reported, but the results on relieving symptom burden have been inconsistent (Aranda et al., 2012; Barsevick et al., 2010; Coolbrandt et al., 2014; Kearney et al., 2009; Molassiotis et al., 2009; Williams, Williams, Lafaver-Roling, Johnson, & Williams, 2011). Some produce clinically meaningful and statistically relevant reductions in symptom severity and/or distress, whereas others do not. Unfortunately, reviews of these intervention studies found that it is not possible to make definitive conclusions about the vital parts or core elements of the interventions (Coolbrandt et al., 2014; Howell, Harth, Brown, Bennett, & Boyko, 2017). The interventions' content, doses, and the causal processes that are targeted and produce better outcomes vary widely and often are sparsely reported. In addition, the mediators between intervention and effect are often not evaluated (Coolbrandt et al., 2014; Howell et al., 2017). Remedying this deficit is key to making advancements. Specifically, understanding causal mechanisms enriches not only the understanding of the interventions' effects (or lack thereof), but also facilitates the

development of more effective interventions (Michie, Fixsen, Grimshaw, & Eccles, 2009).

The focus of this quasiexperimental study is the CHEMO-SUPPORT intervention that the authors developed using the intervention mapping approach. The intervention mapping approach (Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2011) is a conceptual framework for systematically developing theory- and evidence-based healthcare programs in five steps:

- A needs assessment
- The formulation of proximal program objectives
- The selection of methods and strategies
- The production of program components
- Planning for implementation and evaluation

The resulting CHEMO-SUPPORT intervention aims to help patients undergoing chemotherapy to adequately self-manage their symptoms at home by improving their self-efficacy and outcome expectations. The importance of patients' beliefs about self-efficacy and outcome expectations in relation to changing behavior and promoting health outcomes has been widely acknowledged. The social cognitive theory outlines the importance of a person's sense of control in changing health behavior (Glanz, Rimer, & Viswanath, 2008; Nutbeam, Harris, & Wise, 2010). In the context of symptoms related to cancer treatment, patients' lack of knowledge and experience, feelings of uncertainty, and sense of powerlessness have been reported (Coolbrandt et al., 2015; Kidd, Hubbard, O'Carroll, & Kearney, 2009; Pedersen et al., 2012; Spichiger, Rieder, Muller-Frohlich, & Kesselring, 2012; Sun et al., 2007, 2012). A study by Liang et al. (2016) of patients with breast cancer supported the negative association of symptom distress and symptom management self-efficacy and suggested that higher symptom management self-efficacy can reduce the link between symptom distress and quality of life.

The primary aim of the current study was to evaluate the efficacy of CHEMO-SUPPORT in reducing overall symptom distress (OSD) and other symptom-related outcomes in adult patients with cancer starting their first chemotherapy treatment. Secondly, the authors' goal was to explore the intervention's effect mechanism(s). Therefore, the authors measured intermediate outcomes (i.e., outcomes on the pathway to the final outcome) as targeted by the intervention (i.e., self-efficacy).

Scope of the Intervention

CHEMO-SUPPORT was designed to improve self-efficacy and outcome expectations related to dealing with chemotherapy-related symptoms. First, it was assumed that higher self-efficacy will positively affect symptom distress (Liang et al., 2016). A second effect mechanism targeted by CHEMO-SUPPORT is that higher self-efficacy and outcome expectations will improve health behavior (i.e., self-management of symptoms) and, thereby, reduce symptom severity and distress (Glanz et al., 2008; Nutbeam et al., 2010). The intervention's coaching strategies (i.e., tailored, goal-directed self-management coaching and motivational interviewing) were selected in view of these targeted effect mechanisms. Motivational interviewing is a person-centered nonauthoritarian counseling style strengthening motivations for change (Miller & Rollnick, 2014), and it finds its origin in the transtheoretical model, which presumes people are in different stages of readiness to make behavioral changes.

CHEMO-SUPPORT is an individually tailored nursing intervention directed toward four self-management objectives: performing preventive self-care behavior, monitoring symptoms, timely reporting and discussing of symptoms with healthcare professionals, and performing self-care behavior to relieve symptoms. The intervention offers one in-person coaching session at the start of treatment, one telephone-based coaching session during the first few days at home, a patient information brochure, and access to an online or on-call nursing service for help. Additional coaching is delivered when considered necessary (i.e., based on the individual's actual symptom burden experienced and self-management profile). The brochure provides comprehensive descriptions of symptoms and self-care advice, together with quotes from patients, to enforce patients' self-efficacy and beliefs of control. An overview of the intervention is presented in Table 1. The intervention's coaching strategies are summarized in Figure 1. The development process of the intervention is reported elsewhere (Coolbrandt et al., in press).

A team of six oncology nurses conducted the intervention. Fidelity to the intervention protocol was encouraged by training the intervention nursing team and by making an intervention manual available.

Methods

Design and Setting

To avoid the bias inherent in evaluating complex interventions using simultaneous control and experimental groups, a sequential before/after design was used (Eccles, Grimshaw, Campbell, & Ramsay, 2003). The study was approved by the medical ethics

committee of the University Hospitals of Leuven in Belgium. Patients in the control group were informed about the study purpose (i.e., evaluating the current care), but were not aware of the subsequent interventional study phase. Patients in the intervention group were informed about it and agreed to receive the additional care.

In October and November 2014, patients were enrolled in the control group that received usual care (i.e., the standard care at the University Hospitals of Leuven at that time), which included the following:

- At the start of treatment, ward nurses provided oral and written information on chemotherapy treatment and potential side effects, as well as a symptom diary to report symptoms at home.
- Information and advice were imparted using a didactic approach, hoping to improve self-management by improving patients' knowledge.

TABLE 1. CHEMO-SUPPORT Intervention Overview

When	Where	What	Why	How
Start of treatment	Hospital	First nurse counseling session	■ Preparing patients to adequately deal with side effects at home will elicit four behavioral strategies: □ Preventing side effects □ Monitoring side effects □ Reporting and discussing side effects □ Managing/relieving side effects ■ Getting to know the patient and estimating his or her symptom self-management profile	■ In person ■ Family caregiver present (if possible) ■ New patient brochure ■ Symptom diary ■ Estimated duration: 30–60 minutes
First days at home	Home	Second nurse counseling contact	■ Evaluating symptom burden and □ Reviewing self-management strategies □ Providing or planning professional symptom support ■ Reviewing and reinforcing self-management strategies ■ Estimating the symptom self-management profile of the patient	■ Telephone ■ Symptom diary (optional) ■ Estimated duration: 10–20 minutes
At every hospital appointment or patient contact	Hospital	Evaluation of the need for further intervention	■ Reviewing file reports on the patient self-management profile and actual symptom burden and/or consultation with the clinical nurse ■ Planning and delivering of additional counseling sessions in hospital or at home	■ Assessment of patient file and/or consultation with clinical nurse ■ Planning and delivery of further coaching intervention(s), if necessary
Throughout treatment	Home	Patient brochure: *Dealing With Side Effects From Chemotherapy at Home*	■ Offering information and self-care advice on possible side effects from professionals and fellow patients ■ Describing professional support or resources ■ Formulating alarm signals for contacting healthcare professionals	■ New patient brochure ■ Symptom diary
Throughout treatment	Home	Access to on-call or online nursing service	■ Offering continuous professional support via an approachable nursing service to discuss symptom burden	■ Telephone, working days between 10 and 14 ■ Email

FIGURE 1. CHEMO-SUPPORT Intervention Coaching Strategies

Motivational Interviewing

Ask about the patient's attitude, motivation, and confidence in using self-management strategies.

- Be empathic and show understanding; avoid discussion.
- Explore barriers.
- Develop discrepancy.
- Ask permission to brainstorm along with the patient.
- Support the personal effectiveness.

Goal-Directed Self-Management Coaching

Direct coaching toward four self-management objectives:

- Performing preventive self-care behavior
- Monitoring symptoms
- Timely reporting and discussing of symptoms with healthcare professionals
- Performing self-care behavior to relieve symptoms

Tailoring

Tailor coaching on

- Personal symptom experience
- Personal symptom management style
- Personal context

Tailor intervention dose on

- Symptoms and symptom experience
- Self-management profile

- At every hospital visit, ward nurses evaluated patients' symptoms experienced at home by discussing the diary entries or by asking them questions. Nurses provided a structured report in the electronic patient file.
- Supportive care was provided according to local practice guidelines and based on the clinical judgment of a doctor and nurse.

From March to April 2015, patients were enrolled in the intervention group receiving the CHEMO-SUPPORT intervention. The study was conducted in two oncology day-care units and six oncology wards of the University Hospitals of Leuven in Belgium.

Sample

In both cohorts, patients were recruited prospectively and consecutively if they (a) were adult patients aged 18 years or older with cancer; (b) were starting their first treatment with IV chemotherapy in a treatment regimen requiring ambulatory hospital visits or short hospital stays limited to the administration of chemotherapy; (c) had any tumor type, chemotherapy protocol, stage of disease, and treatment intent; (d) spoke Dutch and were able to understand and fill out the questionnaires; and (e) agreed to participate by signing the informed consent. Patients were excluded if they had started oral anticancer therapy, had started concurrent chemotherapy and radiation therapy treatment, were coached by a breast cancer nurse navigator, or were treated with an experimental therapy in the context of a clinical trial.

To bolster the study's statistical power to detect a time-averaged difference on the primary outcome, a prospective sample size calculation was performed using the formula from Diggle, Heagerty, Liang, and Zeger (2002). The current authors presumed a two-sided 5% significance level, 80% power, and an effect size of 0.4 based on similar intervention studies (Given et al., 2004; Kearney et al., 2009; Molassiotis et al., 2009; Ruland et al., 2010). Power analysis set the required sample size at 72 patients in each group.

Data Collection

Clinical patient data were extracted from the patient file. The MAX2 index (Extermann et al., 2004) allowed the authors to objectively compare toxicity of treatment regimens in both groups. If unavailable, MAX2 was calculated using published toxicity data of the treatment regimen.

OSD was selected as the primary outcome in this study. Overall symptom severity (OSS) and number of symptoms (NoS) were secondary outcomes, as were symptom prevalence and severity and distress of a predefined set of eight most prevalent and/or most clinically relevant individual symptoms. Because of the known disconcordance between clinician-reported and self-reported symptom outcomes (Atkinson et al., 2016; Basch et al., 2014), symptom endpoints were measured using self-report questionnaires.

Assessments were made at four time points: (a) T0 (baseline): at the start of treatment (cycle 1, day 1); (b) T1: at three weeks plus or minus one week, coinciding with the hospital visit for the administration of the second treatment cycle; (c) T2: at six weeks plus or minus one week since the start of treatment; and (d) T3: at 12 weeks plus or minus one week since the start of treatment.

Patients self-reported symptom severity and symptom distress of 13 symptoms (nausea, vomiting, taste changes, oral mucositis, diarrhea, constipation, fatigue, pain, rash, psychological distress, peripheral neuropathy, tearing eyes, and hearing loss) at the four time points. Severity was evaluated using a patient-language translation from Basch et al. (2005) of the Common Terminology Criteria for Adverse

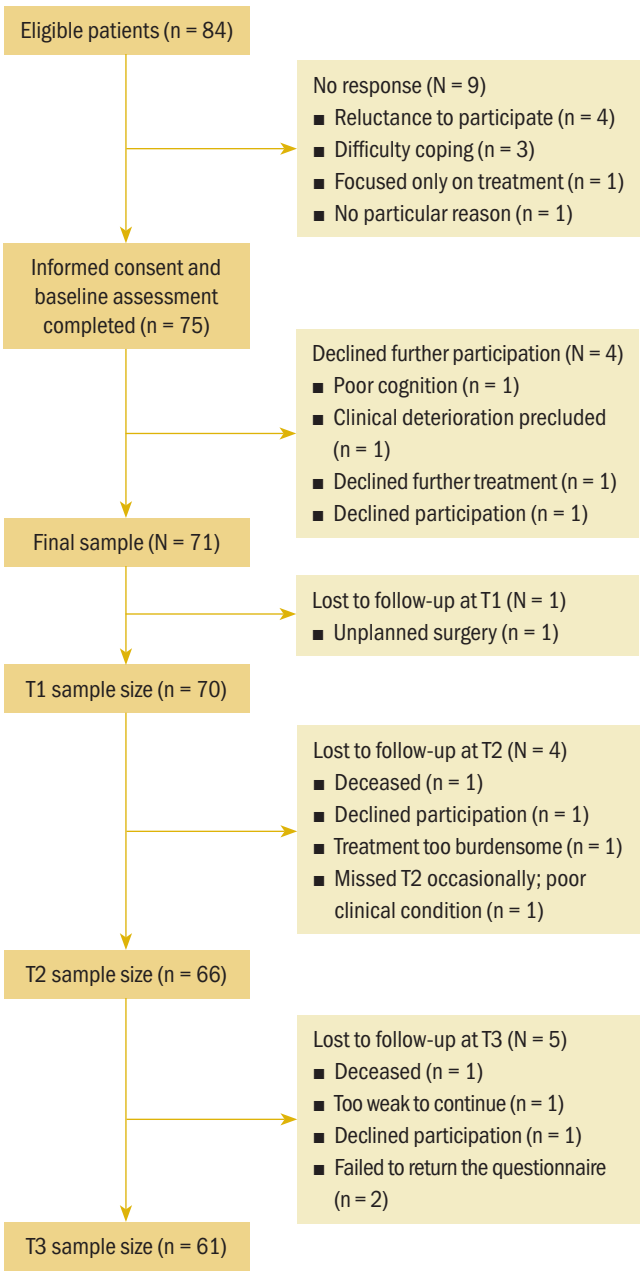
Events (CTCAE), version 4.0 (range = 0–3). Distress was evaluated using a three-point Likert-type scale, ranging from 0 (not distressing) to 2 (very distressing). Severity and distress scores were summed to calculate the overall symptom distress (range = 0–26) and overall symptom severity (range = 0–39). The internal consistency for OSD was good (Cronbach alpha = 0.73 at T2 and 0.77 at T0). For OSS, internal consistency was acceptable (Cronbach alpha = 0.68 at T3 and 0.72 at T0). Symptom prevalence and NoS were calculated on the basis of symptom severity scores higher than 0. NoS (range = 0–13) reflects the total NoS experienced by the patient, and symptom prevalence indicates the proportion of patients having experienced a symptom.

The authors also collected data on three intermediate outcomes. Self-efficacy and outcome expectations were self-reported at T2. To assess patients' self-efficacy, the authors used a shortened version of the validated Cancer Behavior Inventory based on 9 of its original 33 items for treatment-related symptoms (Merluzzi, Nairn, Hegde, Martinez Sanchez, & Dunn, 2001). The self-efficacy scores ranged from 9 (lowest self-efficacy possible) to 81 (highest self-efficacy). Internal consistency for this scale was excellent (Cronbach alpha = 0.9). Because no instruments were available to evaluate outcome expectations, the authors used a self-constructed scale with statements measuring patients' beliefs in the positive outcomes of the patient performance objectives of CHEMO-SUPPORT: performing preventive self-care behavior, monitoring symptoms, timely reporting and discussing of symptoms with healthcare professionals, and performing self-care behavior to relieve symptoms. Each statement was evaluated on a five-point Likert-type scale yielding a final score ranging from 5 (lowest outcome expectations) to 25 (highest outcome expectations). Preliminary evaluation showed very good internal consistency (Cronbach alpha = 0.82). Next, a brief version of the validated Leuven Questionnaire for Patient Self-Care During Chemotherapy (Coolbrandt et al., 2013) was used to evaluate the adequacy of patients' self-management of chemotherapy-related symptoms at T3. The self-care score ranged from 0 (most inadequate self-management of chemotherapy-related symptoms) to 100 (most adequate self-management).

Additional data aimed at assessing professional care (e.g., having received oral information, written information, and a symptom diary; having symptoms discussed and/or managed) were gathered at T1 and T3 to evaluate the actual professional care received by both groups.

All patient questionnaires were delivered and collected in closed envelopes by staff uninvolved in the delivery of the intervention.

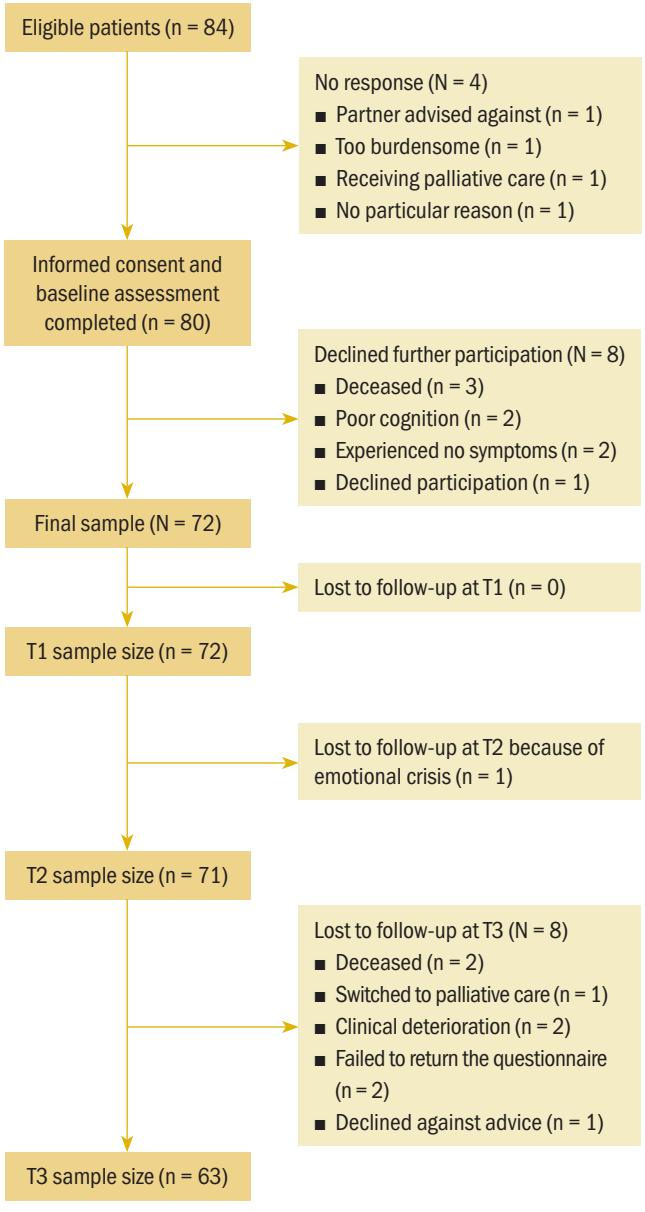
FIGURE 2. Usual Care Patient Group Flow Diagram Based on CONSORT Guidelines



CONSORT—Consolidated Standards of Reporting Trials; T1—3 weeks plus/minus 1 week; T2—6 weeks plus/minus 1 week; T3—12 weeks plus/minus 1 week

Finally, to enable confident interpretation of the results and to facilitate replication of the intervention, process indicators were collected to fully describe relevant aspects of the intervention as it was delivered (e.g., duration of nurse–patient contacts) and to monitor intervention fidelity (i.e., delivered as intended). After every patient contact, intervention nurses used a structured form for recording these data.

FIGURE 3. CHEMO-SUPPORT Intervention Group Flow Diagram Based on CONSORT Guidelines



CONSORT—Consolidated Standards of Reporting Trials; T1—3 weeks plus/minus 1 week; T2—6 weeks plus/minus 1 week; T3—12 weeks plus/minus 1 week

Data Analysis

The quality of the dataset was ensured by checking a random subset of the entered data, and searching for extreme values. For missing data, composite scores were rescaled based on the number of missing data for all endpoints and were excluded if more than 50% of the items in the instrument had missing data.

For analyzing symptom-related endpoints, the authors calculated the difference between the control and intervention groups regarding their change from baseline (difference between follow-up measurements [T1–T3] and T0). The reason for analyzing change scores rather than raw scores was the presence of a baseline difference in OSD between the groups. In addition, in nonrandomized studies, the approach of correcting for baseline difference is more prone to bias (Van Breukelen, 2006, 2013). The primary analysis consisted of testing a main group effect (i.e., whether the change from baseline was different between the intervention and control groups). Secondly, the authors tested a group-by-time interaction effect (i.e., whether the differences between both groups in this change score was different across time points). Other endpoints were analyzed using Mann-Whitney U tests.

Linear models for analyzing symptom-related endpoints were constructed using SAS® software, version 9.4. All other analyses were performed using IBM SPSS Statistics, version 19.0.

Results

Patient Characteristics

The patient flow for this study is illustrated in Figures 2 and 3. The control and intervention groups consisted of 71 and 72 patients, respectively. Patient characteristics are presented in Table 2. No differences were noted between control and intervention groups on any sociodemographic variables. MAX2 indicated comparable toxicity of treatments in both groups. Baseline OSD was significantly higher in the intervention group ($p < 0.05$).

Characteristics of the Intervention

Although they were using different approaches and materials, almost all patients in both groups received oral and written information. However, access to the symptom diary (which was used in both groups) and contact information was significantly lower in the

TABLE 2. Sample Characteristics by Group

	Control (N = 71)		Intervention (N = 72)		
Characteristic	**Median**	**Range**	**Median**	**Range**	**p**
Age (years)[a]	65	19–87	62	19–85	0.56
MAX2 index of treatment regimen[b]	0.14	0–0.44	0.14	0.03–0.34	0.55
Number of symptoms at baseline	3	0–10	4	0–11	0.05
Overall symptom severity at baseline	3	0–19	6	0–19	0.08
Overall symptom distress at baseline	1	0–14	2.08	0–13	0.02
Characteristic		**n**		**n**	**p**
Gender					**0.61**
Male		45		42	
Female		26		30	
Educational level attained					**0.34**
Less than high school diploma		10		17	
High school diploma		35		30	
Higher (post-secondary) education		24		24	
No response		2		1	
Employment status					**0.21**
Unemployed/retired		41		42	
Break in employment or study		18		13	
Still working/studying		7		14	
No response		5		3	
Residence situation					**0.82**
Living alone		11		13	
Living with partner/family		60		59	
Social support within the family					**0.95**
(Rather) poor		6		6	
Moderate		7		6	
(Rather) much		57		59	
Social support outside the family					**0.82**
(Rather) poor		4		6	
Moderate		16		16	
(Rather) much		51		50	
No response		1		–	
Tumor type					**0.6**
Digestive		16		20	
Urogenital		10		4	
Gynecologic		8		10	
Respiratory		14		17	
Hematologic		13		11	
Other		10		10	
Oncologic history					**0.17**
New diagnosis		56		64	
Recurrent disease		14		8	
No response		1		–	

Continued on the next page

TABLE 2. Sample Characteristics by Group *(Continued)*

Characteristic	Control (N = 71) n	Intervention (N = 72) n	p
Setting			**0.34**
Adjuvant	15	16	
Neo-adjuvant	9	8	
Curative	11	10	
Palliative	25	33	
Unknown	11	5	
No response	–	1	
Type of chemotherapy[c]			**0.45**
Anthracycline-based regimen	11	6	
Platinum-based regimen	47	52	
Taxane-based regimen	7	5	
Other	6	9	
Clinical events during study participation[d]			**–**
Oncologic surgery	2	3	
Planned stop of chemotherapy	2	–	
Unplanned stop of chemotherapy	1	5	
Dose reduction	7	2	
Switch therapy	9	7	

[a] Normally distributed; comparison performed using parametric independent samples t-test
[b] MAX2 unavailable; unable to calculate MAX2 because lacked adequate toxicity data needed for the MAX2 formula for 14 patients (8 in the control group, 6 in the intervention group)
[c] Platinum-containing regimens in combination with anthracycline or taxane were classified as platinum-based regimens.
[d] Not all participants had a clinical event during study participation.

control group. There were no differences between both groups in having symptoms discussed or managed by professional caregivers at 3 and 12 weeks.

All but four patients in the intervention group received all four intervention components. On a scale of 0–100, the mean fidelity in executing the complete intervention was 88.2, with the first coaching session component of the intervention reaching the highest fidelity (98.4) and the patient-initiated calls component having the lowest execution fidelity (76.8).

Symptom-Related Outcomes

OSD appeared to get worse over time for both the CHEMO-SUPPORT intervention and control groups. However, worsening of OSD from baseline (T0) to the follow-up assessments (T1–T3) was significantly smaller in the intervention group than in the control group ($p < 0.05$) (see Table 3). The group-by-time interaction for OSD was not significant ($p = 0.1$). These results indicate that the OSD worsening from baseline is significantly smaller in the intervention group and that this pattern was statistically similar over time. The mean change OSD versus baseline OSD ranged from 0.1–1 in the intervention group, and from 1.6–2.5 in the control group (see Table 4); smaller values indicate better, or less worsening, of symptoms.

As with the OSD results, the main group effect for OSS was significant ($p < 0.05$), with mean worsening in OSS being significantly smaller in the intervention group at all time points. Again, no significant group-by-time interaction was noted for OSS. Regarding NoS, the two groups were statistically similar.

A fine-grain analysis of individual chemotherapy-related symptoms experienced by patients reveals an interesting and fairly consistent pattern of which symptoms are affected most by the intervention (see Table 5). Calculating odds ratios for eight individual symptom-related outcomes revealed a significantly lower prevalence, severity, and distress in

the intervention group for fatigue, and a significantly lower severity and distress for pain. Although not statistically significant, all odds ratios, except odds ratios for prevalence and severity of diarrhea, suggest a trend toward less worsening of individual symptom outcomes in the intervention group.

Intermediate Outcomes

Self-efficacy and outcome expectations were significantly better in the intervention group (see Table 6). After correction for baseline differences in OSD, self-efficacy at T2 was still significantly better in the intervention group than in the control group. Although self-care was better in the intervention group, this was not statistically significant.

Discussion

The authors' results demonstrate that an individually tailored nursing intervention that supports symptom self-management using motivational interviewing, called CHEMO-SUPPORT, significantly decreases overall symptom distress and symptom severity in adult patients starting their first treatment with chemotherapy.

CHEMO-SUPPORT aims to improve patients' self-management of chemotherapy-related symptoms by boosting self-efficacy beliefs and outcome expectations for dealing with symptoms. The influence of patients' beliefs on their behaviors and, consequently, health outcomes is established (Glanz, 2008; Hoffman, 2013; Liang et al., 2016; Nutbeam et al., 2010). Unfortunately, a substantial number of patients feel powerless or fatalistic in gaining symptom relief (Bennion & Molassiotis, 2013; Coolbrandt et al., 2015; Spichiger et al., 2012), and this influences their way of coping (Coolbrandt et al., 2015; Kidd et al., 2009), leading to sometimes dealing with symptoms passively. Symptom management programs should focus on enhancing patients' perception of control, rather than simply providing coping information (Kidd et al., 2009). A systematic review demonstrated that an increasing number of self-management interventions for patients with cancer target patients' confidence and self-efficacy, both in the context of adjusting to new roles and self-managing the emotional impact of cancer, as well as self-managing treatment and symptoms (Howell et al., 2017). Unfortunately, intervention studies rarely assess these intermediate outcomes. This hampers the understanding of the effect mechanisms of interventions and the identification of effective elements and strategies for improving self-management (Coolbrandt et al., 2014; Howell et al., 2017).

As a result of the intervention mapping approach, tailoring and motivational interviewing were selected as theory-based methods to positively address patients' beliefs (Coolbrandt et al., in press). From the results, the authors can conclude that self-efficacy and

TABLE 3. Descriptive and Statistical Results for Overall Symptom-Related Outcomes

Test	$\bar{X}$ Change Difference	95% CI	p
Overall symptom distress			
Main group effect	−1.4	[−2.5, −0.3]	0.01
Group by time interaction	–	–	0.1
Overall symptom severity			
Main group effect	−1.9	[−3.4, −0.5]	0.01
Group by time interaction	–	–	0.13
Number of symptoms			
Main group effect	−0.5	[−1.4, 0.3]	0.2
Group by time interaction	–	–	0.16

CI—confidence interval
Note. A mean change difference less than 0 indicates that the overall symptom distress, overall symptom severity, or number of symptoms change from baseline is smaller in the intervention group.

TABLE 4. Point Estimates and 95% CIs of the Mean Change Versus Baseline of Symptom-Related Outcomes

	Control Group		Intervention Group	
Time	$\bar{X}$ Change	95% CI	$\bar{X}$ Change	95% CI
OSD				
T1	1.6	[0.7, 2.6]	1	[0.1, 1.9]
T2	2	[1.2, 2.8]	1	[−0.7, 0.9]
T3	2.5	[1.5, 3.5]	1	[0, 2]
OSS				
T1	2.8	[1.6, 4.1]	1.8	[0.6, 3]
T2	3.2	[2.1, 4.4]	0.6	[−0.5, 1.8]
T3	4.1	[2.6, 5.6]	1.7	[0.2, 3.2]
NoS				
T1	1.7	[1.1, 2.3]	1.5	[0.8, 2.1]
T2	2	[1.3, 2.7]	1	[0.3, 1.7]
T3	2.4	[1.6, 3.2]	1.5	[0.7, 2.3]

CI—confidence interval; NoS—number of symptoms; OSD—overall symptom distress; OSS—overall symptom severity; T1—3 weeks plus/minus 1 week); T2—6 weeks plus/minus 1 week; T3—12 weeks plus/minus 1 week

outcome expectations were significantly enhanced in patients receiving the CHEMO-SUPPORT intervention, and this may explain the better dealing with, or dampening of, overall symptom distress in the intervention group. The significant improvement in perceived overall symptom severity in patients who received the CHEMO-SUPPORT intervention suggests that enhanced self-efficacy beliefs lead to better self-management and, consequently, better symptom relief. Unfortunately, measurement of self-care failed to reach statistical significance, although the absolute values on this outcome were, on average, higher in the intervention group.

TABLE 5. Odds Ratios for Eight Individual Symptom-Related Outcomes

Symptom	Odds Ratio	95% CI	p[a]	p[b]
Symptom prevalence				
Nausea	1.3	[0.7, 2.2]	0.41	0.12
Taste changes	1.5	[0.8, 2.6]	0.19	0.24
Fatigue	2.8	[1.4, 5.9]	0.00	0.44
Pain	1.4	[0.8, 2.6]	0.26	0.49
Psychological distress	1.6	[0.9, 2.9]	0.12	0.77
Oral mucositis	1.8	[0.9, 3.4]	0.09	0.88
Diarrhea	0.9	[0.5, 1.9]	0.84	0.73
Constipation	1.2	[0.7, 2.3]	0.5	0.18
Symptom severity				
Nausea	1.4	[0.8, 2.3]	0.24	0.13
Taste changes	1.6	[1, 2.8]	0.06	0.24
Fatigue	2.3	[1.4, 3.9]	0.00	0.33
Pain	2.1	[1.2, 3.6]	0.01	0.46
Psychological distress	1.6	[0.9, 2.8]	0.09	0.99
Oral mucositis	1.6	[0.9, 3]	0.11	0.88
Diarrhea	1	[0.5, 1.9]	0.98	0.77
Constipation	1.1	[0.6, 2.1]	0.7	0.11
Symptom distress				
Nausea	1.3	[0.8, 2.3]	0.33	0.34
Taste changes	1.5	[0.9, 2.5]	0.15	0.1
Fatigue	1.9	[1.1, 3.3]	0.03	0.36
Pain	2	[1.1, 3.7]	0.02	0.49
Psychological distress	1.5	[0.8, 2.7]	0.2	0.41
Oral mucositis	1.6	[0.8, 3.4]	0.18	0.69
Diarrhea	1.1	[0.6, 2.3]	0.69	0.62
Constipation	1	[0.5, 2]	0.92	0.46

[a] For group effect
[b] For group by time interaction effect
Note. An odds ratio greater than 1 indicates more improvement or less worsening of symptoms in the intervention than in the control group; an odds ratio of less than 1 indicates more improvement or less worsening of symptoms in the control than in the intervention group.

The intervention dose (i.e., the amount of the intervention delivered) is suggested as a critical element in these types of behavioral interventions (Hoffmann et al., 2014), and is highly variable across similar interventions (Coolbrandt et al., 2014). The authors' finding that a brief theory-driven intervention dose is efficacious may support the presumption that evidence- and theory-based intervention development improves potential effects of healthcare programs (Bartholomew et al., 2011). Whether or not higher intensity and/or longer duration of the intervention would yield better effects on symptom outcomes is unclear at this stage.

Next to its potential impact on the intervention's effect, the dose also affects the nursing time required (i.e., the intervention cost). By tailoring the intervention and accelerating the intervention dose for patients more at-risk for poor self-management, CHEMO-SUPPORT succeeded in limiting costs (about one hour of extra nursing contact time for the two standard coaching sessions), while still producing meaningful benefits for patients. Interestingly, Molassiotis et al. (2009) found that an intense home-care program decreased overall costs by reducing the number of inpatient days and the number of calls to the hospital emergency hotline.

This single-center quasiexperimental study of the CHEMO-SUPPORT intervention has several limitations. The study of complex interventions poses methodologic challenges (Blackwood, 2006; Craig et al., 2008). Although a randomized, controlled trial is still considered to have the greatest evidentiary value, the authors chose a sequential nonrandomized design for this single-center study to avoid possible contamination between intervention and control groups (Eccles et al., 2003). Given that patients in both groups attended the same wards, a simultaneous control group implied a real risk of exposing elements of the intervention to the participants in the control group and, ultimately, of diluting the intervention effect (Chen, Hemming, Stevens, & Lilford, 2016; Hooper, Froud, Bremner, Perera, & Eldridge, 2013) Contamination could occur not only via patients in the two groups sharing aspects of the intervention among themselves (e.g., the brochure), but also via clinical nurses informed about the design, methods, and mechanisms of CHEMO-SUPPORT (e.g., larger focus on self-management in the usual care).

In addition, this was a single-center study, and the quality of standard or usual care may have influenced the potential effect size of CHEMO-SUPPORT. At the study center, numerous efforts have been made to improve the standard of care regarding side effects during chemotherapy (e.g., the implementation of a symptom diary). Therefore, the results of this study should not be generalized without consideration of the nature of standard care provided.

Regarding the performance of the intervention, intervention nurses self-reported on their performance of motivational interviewing and other elements of the intervention, but intervention fidelity was not monitored using audio recordings, as is encouraged in the context of interventions using motivational interviewing (Miller & Rollnick, 2014).

Finally, a number of scales were used for evaluating patient-reported symptom burden and treatment toxicity (Coolbrandt et al., 2014; Kirkova et al., 2006). They differ in the number and type of symptoms targeted, the symptom dimension(s) evaluated, the scales used for self-report, and the extent of psychometric evaluation (Kirkova et al., 2006). This heterogeneity hampers the comparison of different study results (Coolbrandt et al., 2014; Kirkova et al., 2006); however, progress is being made on this front (Basch et al., 2014; Dueck et al., 2015). As more interventions target self-efficacy as a key determinant for improving self-management, the need for a gold standard for measuring self-efficacy becomes apparent too. This is confirmed by the multiplicity of scales used to measure self-efficacy in recent or ongoing intervention studies, including the current study (Chan, Yates, & McCarthy, 2016; Foster et al., 2016; Hochstenbach, Courtens, Zwakhalen, van Kleef, & de Witte, 2015; Komatsu, Yagasaki, & Yamaguchi, 2016; Ream, Gargaro, Barsevick, & Richardson, 2015; Zhang et al., 2014).

KNOWLEDGE TRANSLATION

- A tailored nursing intervention directed at clear self-management objectives significantly reduces chemotherapy-related symptom distress.
- The intervention's ability to enhance self-efficacy and outcome expectations may reduce symptom burden during chemotherapy treatment.
- Careful estimation of patients' self-management strategies should prompt a more intensive intervention to manage symptoms.

Implications for Nursing

The positive effects of the CHEMO-SUPPORT intervention highlight the role of oncology nurses in coaching patients to adequately self-manage their treatment-related symptoms at home. The study results recommend direct coaching using clear self-management objectives. Secondly, the current study suggests motivational interviewing as an effective strategy to strengthen a person's own motivations for dealing with chemotherapy-related symptoms. Training, as well as having an intervention manual, is needed to effectively integrate motivational interviewing in daily nursing practice (Madson, Loignon, & Lane, 2009).

Because the results of this study promote a brief but tailored intervention to be amplified on patients' self-management profiles, adequate detection of patients at risk for poor symptom self-management becomes paramount. Earlier symptom-management

TABLE 6. Results for Intermediate Outcomes

	Control (N = 71)		Intervention (N = 72)		
Outcome (Range[a])	Median	IQR	Median	IQR	p
Self-efficacy at T2 (9–81)	69	13	74	12.8	0.02/0.02[b]
Outcome expectations at T2 (5–25)	20	3	20	3	0.04[c]
Self-care at T3 (0–100)	69	24.1	73	28.3	0.35

[a] Higher scores mean better self-efficacy, better outcome expectations, and more adequate self-management of chemotherapy-related symptoms.
[b] Corrected for overall symptom distress at baseline using a multivariable linear regression model
[c] Difference in outcome expectations between both groups is apparent from the 25 and 75 quartile values: 19–22 in the control group and 20–23 in the intervention group.
IQR—interquartile range; T2—6 weeks plus/minus 1 week since start of treatment; T3—12 weeks plus/minus 1 week since start of treatment

interventions were tailored on patients' symptom experiences and severity alone (Kearney et al., 2009; Molassiotis et al., 2009). To detect the need for further self-management coaching, however, nurses should also discuss and consider patients' perceived self-efficacy to manage their symptoms. Additional research is needed to develop and validate a set of factors that assists nurses in adequately estimating patients' risk profile and tailoring self-management support.

Conclusion

The current study demonstrated that the CHEMO-SUPPORT nursing intervention has a significant effect on symptom distress and symptom severity during chemotherapy, resulting in less worsening of symptoms overall. These positive effects highlight the role of nurses in coaching patients to adequately self-manage their treatment-related symptoms at home. In addition, the evaluation of intermediate outcomes strongly supports the hypothesis that patient self-efficacy and outcome expectations are the effect mechanism of the intervention. This finding encourages the development of nursing interventions aimed at reducing symptom burden during chemotherapy.

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