

# Oncology Nurses' Awareness of Cognitive Impairment Secondary to Chemotherapy

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The purpose of this cross-sectional, descriptive pilot study was to collect frequency data for oncology nurses' awareness of cognitive impairment (CI) secondary to chemotherapy, practice patterns related to assessment and education of patients and families about CI, and access to related educational materials. A convenience sample of 34 RNs was used in conjunction with a local Oncology Nursing Society chapter meeting. An 18-item survey was developed and piloted to collect data and demographic information from participants. Participants (100%) acknowledged awareness of chemotherapy-related CI. Most (94%) had attended educational programming on the topic and agreed that their patients had mentioned CI. Only 38% of participants assessed patients for CI and 44% educated patients and families on the topic. All nurses agreed that CI had some impact on patients' ability to perform activities of daily living and that CI caused at least some degree of distress. Most participants (71%) did not have access to related patient and family educational tools. The study provided support for the development of educational programs related to appropriate patient assessment and the development and distribution of related patient and family educational tools.

**P**atients receiving antineoplastic therapy (specifically chemotherapy) for cancer treatment may experience impairment to cognitive function (Jansen, Miaskowski, Dodd, Dowling, & Kramer, 2005). Retrospective trials estimate that cognitive impairment (CI) occurs in 17%–75% of patients receiving chemotherapy (Wefel, Lenzi, Theriault, Davis, & Meyers, 2004). Although few prospective trials have been conducted to ascertain the risk factors and incidence of this adverse event, Wefel et al. assessed the effects of standard-dose adjuvant chemotherapy in women with breast cancer (N = 18). Neurocognitive testing was performed at baseline, six months, and one year after chemotherapy. Almost 66% of participants exhibited a decline in performance between baseline and the six-month assessment. Only 50% of those who experienced a decline demonstrated a subsequent improvement at the one-year evaluation.

Distinctions have been drawn between acute neurologic impairment, such as toxic leukoencephalopathy, and the more subtle changes in cognitive function referred to as “chemo brain” (Jansen et al., 2005). The subtlety is reflected by the lack of correlation between patient self-report of cognitive dysfunction and subsequent performance on neurocognitive tests in some studies (Wefel et al., 2004). A significant number of patients have evidence of CI prior to the initiation of therapy. Wefel et al. noted that 33% of patients with breast cancer in their prospective study exhibited CI at baseline. The finding

## At a Glance

- ◆ Oncology nurses generally are aware that cognitive impairment (CI) can be associated with chemotherapy.
- ◆ Most oncology nurses do not have access to assessment guides or teaching tools about CI associated with chemotherapy.
- ◆ Oncology nurses perceive CI associated with chemotherapy as related to distress in patients and potentially having a negative impact on activities of daily living.

emphasizes the need for prospective trials that include baseline neurocognitive testing.

A variety of mechanisms have been proposed for CI, including direct injury to cerebral gray and white matter, microvascular injury (Wefel et al., 2004), cytokine-induced

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inflammatory response, chemotherapy-induced anemia, and chemotherapy-induced menopause (Jansen et al., 2005). The specific domains of cognitive function that may be affected include executive function, information-processing speed, language, motor function, spatial skills, learning, and memory (Jansen et al.). Some studies indicate that a subset of patients may experience CI that does not resolve over time (Ahles & Saykin, 2002). For example, Ahles and Saykin (2001) estimated that 17%–35% of patients with or without cancer will experience CI that does not resolve. Such patients may be genetically predisposed to more significant and longer-lasting injury, which may be related to the presence of the apolipoprotein E 4 allele. This allele has been associated with Alzheimer disease, CI accompanying aging, as well as damaged and decreased repair after brain injury (Ahles & Saykin, 2001, 2007). Prospective trials evaluating aspects of CI related to chemotherapy are beginning to assess the possible association of this genetic component (Ahles & Saykin, 2002). Because of the possible influence of other factors, prospective trials have controlled for hormonal status, anxiety, depression, and fatigue (Ahles & Saykin, 2001) and demonstrated that these factors occurred independently from CI (Ahles & Saykin, 2001, 2007; Ahles et al., 2002; Wefel et al., 2004).

CI in breast cancer has been the focus of much of the literature to date (Castellon et al., 2004; Kreukels et al., 2006; O'Shaughnessy, 2003; Schagen, Muller, Boogerd, & van Dam, 2002). An association between chemotherapy-induced anemia and CI has been noted for solid tumors (Mancuso, Migliorino, De Santis, Saponiero, & De Marinis, 2006; Massa, Madeddu, Lusso, Gramignano, & Mantovani, 2006); some interesting preliminary work also is being done in the areas of testicular cancer and other tumor types treated with cisplatin (Shapiro, Jacobs, Palmer, Coyne, Meadows, & Vaughn, 2005; Troy et al., 2000). In addition, CI has been demonstrated in patients receiving standard-dose chemotherapy for lymphoma (Ahles et al., 2002). Ahles et al. compared survivors of Hodgkin's disease and non-Hodgkin lymphoma with survivors of breast cancer and found, regardless of diagnosis, a similar incidence of CI that persisted as long as 10 years after completion of treatment.

Oncology nurses are key to identifying patients at high risk for chemotherapy-related side effects, assessing patients for potential sequelae, and providing accurate and appropriate patient and family education about expected and potential toxicities (Johnson & Henke Yarbrow, 2000; Oncology Nursing Society [ONS], 2006). Many institutions require specialized preparation of RNs who will be administering chemotherapy (ONS). According to ONS, RNs administering chemotherapy should successfully complete the ONS chemotherapy and biotherapy course or a course with comparable didactic content. The ONS chemotherapy and biotherapy guidelines and recommendations for practice currently are under revision to include content on chemotherapy-related CI (Polovich, Olsen, & Whitford, in press).

Patients have expressed concern about CI and their subsequent ability to resume previous professional, scholastic, and social activities (Wefel et al., 2004). Given the significance of CI to patients, the oncology nursing community must remain up-to-date in its knowledge of CI as a potential side effect of chemotherapy so that appropriate assessments and educational

materials can be developed and implemented (O'Shaughnessy, 2003). This is particularly important because of the potential impact CI has on patients' quality of life (Ahles & Saykin, 2001). Research is needed to assess the current knowledge and awareness that oncology nurses have about CI. Findings from basic descriptive studies can help identify areas of need and serve as a baseline for future investigation and program development.

## Specific Aims of Research

The purpose of this project was to describe oncology nurses' awareness of, assessment of, and education practices for CI secondary to chemotherapy. A secondary aim of the study was to assess the availability of patient and family educational materials related to CI. This descriptive study was designed to answer the following research questions.

- Are oncology nurses aware of CI secondary to chemotherapy?
- Do oncology nurses assess patients for CI secondary to chemotherapy?
- Do oncology nurses educate patients and families about CI secondary to chemotherapy?
- Do oncology nurses have access to materials or tools for educating patients and families about CI secondary to chemotherapy?

Data also were collected to identify more specific information related to beliefs held by oncology nurses regarding the occurrence of CI secondary to chemotherapy.

## Methods

### Participants

An ONS chapter in the midwestern area of the United States agreed to participate in this descriptive study. The chapter membership included approximately 150 oncology nurses, with 20–50 nurses attending the monthly meetings. The chapter Board of Directors granted permission for the study to be conducted at a regularly scheduled chapter meeting. Approval also was obtained from the University of Kansas Medical Center Human Subjects Committee. Of the 44 nurses attending the chapter meeting, 34 completed the survey (77% participation rate). The survey was available only to chapter members attending the meeting. Most respondents had been in nursing more than 20 years, with more than 16 years of experience in oncology (see Table 1). Oncology units and office-based infusion clinics were the most commonly represented practice settings, and most participants held staff nurse positions (see Table 2).

### Survey

**Development:** A simple, 18-item survey was developed to collect descriptive data about oncology nurses' awareness of CI as a sequela to chemotherapy. The survey was designed to be completed within approximately 10 minutes and was piloted for the first time in the present study. Results for 16 of the items are reported here (see Tables 3 and 4). Two questions

**Table 1. Participant Demographics**

CHARACTERISTIC	n	%
<b>Years in nursing</b>		
0–5	1	3
6–10	2	6
11–15	3	9
16–20	4	12
> 20	23	68
Missing	1	3
<b>Years in oncology</b>		
0–5	3	9
6–10	8	24
11–15	3	9
16–20	7	21
> 20	12	35
Missing	1	3
<b>Highest academic preparation</b>		
Diploma	4	12
Associate	3	9
Bachelor's	16	47
Master's	9	27
Missing	2	6
<b>Highest license</b>		
RN	24	71
Advanced practice RN	8	24
Missing	2	6

N = 34

*Note.* Because of rounding, not all percentages total 100.

related to participants' perceptions of specific tumor types and chemotherapy regimens most likely to be associated with CI are not included in this analysis.

**Demographics:** Demographic data about nursing experience, practice setting, role, and educational preparation were collected. The demographic section's format was similar to the ONS membership renewal form to provide a level of familiarity for participants and to provide a complete and reproducible database.

**Awareness of cognitive impairment:** The survey included five questions about familiarity with the term CI or “chemo brain” and history of reading professional or lay literature on the topic. Response options were in a yes or no format.

**Patient and family experience:** Yes or no and percentage estimate response formats also were used for questions regarding patient or family member discussions about CI as a side effect of chemotherapy.

**Assessment and teaching:** Dichotomous items were included about whether the nurse assessed patients for CI, whether patients and families were taught about CI, and whether nurses had access to educational materials about CI.

**Quality of life:** Two items about distress associated with CI and impact on activities of daily living (ADLs) used a five-point Likert-type format, with significant distress and no distress used as the anchor terms.

## Procedure

The survey was distributed during a monthly ONS chapter meeting. Surveys, with an attached cover letter, were placed at the sign-in table. The chapter president introduced the survey

and invited those in attendance to participate in the study. Time for survey completion was provided during the networking time that preceded the program. Participants placed the completed surveys on the sign-in table as they left the meeting.

## Results

Frequencies were calculated for all survey items. All participants reported having heard the term “chemo brain” and most (n = 32, 94%) reported familiarity with the term “cognitive impairment.” Participants had read about the side effect in professional journals (n = 18, 56%) and lay literature (n = 17, 53%). When asked about the incidence of CI among their patients, 23 (68%) estimated that 1%–40% of their patients experienced this side effect, although 32 (94%) indicated that their patients had mentioned CI.

Only 38% (n = 13) of respondents assessed their patients for CI. Less than half of the participants (n = 15, 44%) educated patients about CI, and most (n = 24, 71%) did not have access to relevant educational materials.

More than half of the participants (n = 19, 56%) believed that CI occurs between one and six months after initiation of chemotherapy, and all nurses agreed that CI had some impact on a patient's ability to perform ADLs, with responses ranging from some (3%) to significant impact (38%). Similarly, all nurses indicated they believed that CI caused at least some degree of distress among patients, with most (62%) reporting that CI would cause significant distress.

## Discussion

Oncology nurses in this study were aware of CI as a possible sequela to chemotherapy. Most nurses had attended educational

**Table 2. Participant Practice Setting and Position**

VARIABLE	n	%
<b>Practice setting</b>		
Medical-surgical unit	1	3
Oncology unit	10	29
Hospital-based clinic	2	6
Office-based infusion clinic	14	41
Radiation oncology	4	12
Corporate or industry	1	3
Other	1	3
Missing	1	3
<b>Job title</b>		
Academic educator	1	3
Clinical trials nurse	3	9
Staff nurse	10	29
Director, manager, or coordinator	7	21
Clinical nurse specialist	3	9
Nurse practitioner	6	18
Pharmaceutical representative	1	3
Other	2	6
Missing	1	3

N = 34

*Note.* Because of rounding, not all percentages total 100.

**Table 3. Participant Responses for Awareness, Assessment, and Education Related to Cognitive Impairment (CI)**

SURVEY TOPIC	YES		NO		MISSING	
	n	%	n	%	n	%
Heard of "chemo brain"	34	100	—	—	—	—
Attended educational programming	32	94	2	6	—	—
Read professional literature	19	56	15	44	—	—
Read lay literature	18	53	16	47	—	—
Patients mentioned CI.	32	94	2	6	—	—
Family mentioned CI.	21	62	13	38	—	—
Certain tumors associated with CI	23	68	5	15	6	18
Certain regimens associated with CI	22	65	4	12	8	24
Assess for CI	13	38	17	50	4	12
Educate about CI	15	44	16	47	3	9
Access to educational tools	5	15	24	71	5	15

N = 34

programming on the topic and read about it in professional and lay literature. The nurses believed that CI would negatively affect patients' quality of life. Despite the apparent importance of the problem, most nurses did not assess patients for CI, nor did they teach patients and families about it. In general, most nurses did not have access to relevant educational tools and materials.

Limitations to the study include the use of a small convenience sample. Representativeness is limited because data were collected at one ONS chapter meeting, and surveys were not sent to the entire membership. Oncology nurses who are ONS members and choose to attend chapter educational programs may not be representative of all oncology nurses. Composition of the participants included a high percentage of bachelor's- and master's-prepared nurses. The small sample size was further emphasized by the fact that not all participants answered every question. The missing data appeared to be random.

Prior to the study, the investigators were unable to find evidence to assess the extent of oncology nurses' awareness of CI, their assessment practice patterns, or the access they have to relevant educational tools. Findings support the need for further research in this area. A larger sample size would allow some comparisons to be made related to the influence of role, practice setting, and educational level of the nurses.

The availability and implementation of structured assessment and patient education have been shown to enhance patient outcomes related to decreasing stress and anxiety in a variety of settings (Aubin et al., 2006; Belleau, Hagan, & Masse, 2001; Benor, Delbar, & Krulik, 1998; Smith, Forster, & Young, 2004). Inclusion of specific screening questions in a general assessment tool has been shown to increase the frequency of nurse assessment and documentation (Jackson, 2002). Educational programming to emphasize the importance of patient assessment and access to patient and family teaching tools for chemotherapy-related CI appear to be unmet needs. Replication with a larger sample and representation from a broader geographic distribution of participants may evaluate nurses' knowledge of CI, whether appropriate assessment is being performed, and what educational tools exist.

## Implications for Future Research

Findings from the study suggest the need for development of educational programs to teach nurses about CI assessment and educational tools and materials to facilitate patient and family teaching. Further work is needed to identify the influence of role, practice setting, and educational level of nurses in addition to regional differences in clinical practice patterns. Additional

**Table 4. Participant Responses for Incidence, Timing, and Impact of Cognitive Impairment (CI)**

VARIABLE	n	%
<b>Patients believed to experience CI (%)</b>		
None	1	3
< 1–20	13	38
21–40	10	29
41–60	3	9
61–80	4	12
81–100	1	3
Missing	2	6
<b>Estimated time to appearance of CI (months)</b>		
< 1	1	3
> 1–6	19	56
> 6–12	6	18
> 12	1	3
Other	—	—
Missing	7	21
<b>Distress attributed to CI</b>		
None	—	—
Some	2	6
Moderate	11	32
Significant	21	62
<b>Estimated impact on ADLs attributed to CI</b>		
None	—	—
Some	1	3
Moderate	17	50
Significant	13	39
Missing	3	9

N = 34

ADLs—activities of daily living

*Note.* Because of rounding, not all percentages total 100.

study is needed to identify content for educational programming for oncology nurses. Continued research also is needed to develop and evaluate patient assessment tools and patient and family educational materials. Results of prospective trials will be valuable in identifying the patients most at risk for CI. Much more is to be learned about the risks associated with specific chemotherapy regimens, genetic vulnerability, aging, hormonal levels, and the relationship of related factors such as anxiety, depression, and fatigue. Increased knowledge about associated risks for CI will allow further enhancement of clinical assessment and development of educational tools benefiting patients and the oncology nursing community.

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