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# The Influence of Easy-to-Read Pamphlets About Self-Care Management of Radiation Side Effects on Patients' Knowledge

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**A**lthough beneficial in the control and treatment of cancer, radiation therapy often causes side effects that can range from mild psychological and physical disturbances to severe life-threatening conditions (Hogle, 2007). Management of radiation side effects, including patient self-management, continues to be a priority in the care of patients with cancer and is essential to rehabilitation. One component of care management is health literacy. Although definitions of the term vary, health literacy in the current study indicates "the evolving of skills and competencies needed to find, comprehend, evaluate, and use health information and concepts to make choices and improve quality of life" (Zarcadoolas, Pleasant, & Greer, 2003, p. 119). Poor health literacy hampers patients' ability to understand complex or even basic information or to accurately assess health risks, thereby impairing their ability to engage in self-care (Amalraj, Starkweather, Nguyen, & Naeim, 2009).

Studies have found that the general public is uninformed about radiation therapy, and many new patients are anxious about undergoing the regimen (Halkett, Arbon, Scutter, & Borg, 2007). Once radiation treatment begins, patients are confronted with new and unknown aspects of therapy such as unfamiliar technology, new health-related terms not part of their vocabulary, and a rigorous and demanding treatment schedule that seldom permits delayed or missed appointments (Fitch et al., 2005). As a result, patients often are confused and anxious and harbor misunderstandings about the procedure (Halkett & Kristjanson, 2007). Concurrently, patients in hospital and outpatient settings are expected to comprehend new information and enact behaviors necessary to combat their illness.

Poor health literacy may exacerbate feelings of uncertainty and impede care management of radiation therapy. According to Orem (2001), individuals who perform self-care must possess the abilities to do so. Foundational to self-care are competencies in reading,

**Purpose/Objectives:** To test patients' knowledge of side effects after they review six easy-to-read pamphlets on radiation side effects.

**Design:** Nonexperimental.

**Setting:** Urban radiation oncology clinic.

**Sample:** 47 patients receiving radiation treatment.

**Methods:** The Knowledge of Radiation Side Effects Test was administered.

**Main Research Variables:** Patient literacy and knowledge level.

**Findings:** The self-report of highest grade completed in school was 10th grade; however, the actual reading level was 4th–6th grade. Scores for each knowledge test increased with literacy level, with statistically significant correlations for pamphlets on fatigue, skin problems for women, and skin problems for men. Participants who read at the 4th–6th-grade level scored higher than expected.

**Conclusions:** Although the pamphlets were deemed easy to read, patients who had the lowest reading levels still had difficulty understanding them.

**Implications for Nursing:** In addition to written patient information, oncology nurses should use innovative teaching strategies to improve patient understanding and self-care behaviors. A need exists for continued nursing inquiry that will focus on self-care behaviors to manage radiation side effects, particularly for patients with low literacy.

writing, communication skills, reasoning, perceptual skills, and counting. In theory, the limitation of one's ability to read and comprehend written information interferes with the ability to make informed decisions. A self-care deficit may occur when patients with low literacy are unable to make informed decisions about treatment or engage in self-care behavior, including those related to side effects. When a deficit occurs, nurses may compensate by either guiding patients to the selection of health information of an appropriate literacy level or by using another communication strategy.

To empower patients, minimize confusion, and enhance adherence to recommended treatments, healthcare providers must give patients information at a level they can understand and use to become more informed about their care. Research has shown that informed patients are more likely to be actively involved in their care (Dunn, Steginga, Rose, Scott, & Allison, 2004). This article describes a study focused on the development and field testing of easy-to-read patient education pamphlets about six radiation therapy side effects: loss of appetite, fatigue, skin problems for men, skin problems for women, infection, and emotional issues.

## Literature Review

### Why Patients Need Information They Can Comprehend

Since 1993, the Joint Commission on Accreditation of Healthcare Organizations has been interested in how well patients understand health information regarding their treatment (Doak, Doak, & Root, 1996). Healthcare professionals urge patients to make decisions about health care and participate in their treatment. Informed decisions occur when patients have a clear understanding of their condition or illness and comprehend the benefits and risks of recommended care as well as treatment alternatives (Albrecht & Goldsmith, 2003; Briss et al., 2004; Smith, Trevena, Nutbeam, Barratt, & McCaffery, 2008). Matthews, Sellergren, Manfredi, and Williams (2002) suggested that informed patients feel a sense of control, cope better with uncertainty about their health, tend to follow their plans of care more closely, and recover more quickly than less informed patients. The strategies used by nurses to educate patients about their treatments are critical. Nurses should accurately assess and evaluate a patient's health literacy level and develop an appropriate education intervention to fill any knowledge gaps and information needs.

In 1982, Dodd declared that despite the best intentions of healthcare providers, patients are not given self-care information in a manner they can absorb, retain, and recall when needed. To date, healthcare professionals rely on printed patient instructions to reinforce care, placing the burden of comprehension on the patient. If a patient cannot understand the information, failure to follow recommended regimens may result. In addition, the inability to comprehend increases anxiety and limits communication with healthcare providers (Baker, Wilson, & Winebarger, 2004). In the context of a serious illness such as cancer, health literacy takes on particular importance. Research has indicated that patients with low literacy consistently demonstrate inadequate knowledge about their disease, resulting in delayed diagnosis and treatment and lower compliance rates (Bevan & Pecchioni, 2008; DeWalt, Berkman, Sheridan,

Lohr, & Pignone, 2004). Therefore, access to information about radiation side effects that patients can understand is paramount to positive patient outcomes.

Much of the discussion and research regarding patient education materials has been limited to relationships between low literacy and patient decision making, medication administration, communication, and self-care management of chronic diseases. Numerous studies have been conducted on the development and evaluation of easy-to-read patient education materials (Roland et al., 2009; Rudd, 2010; Wilson, Brown, & Stephens-Ferris, 2006), yet gaps exist in the literature on easy-to-read materials focused on temporary treatments such as self-care management of radiation side effects. The current study sought to address that disparity.

### Written Patient Education Materials

Since 2000, technology in the healthcare paradigm has created multimedia strategies such as cyber health, electronic medical records, telemedicine, text and electronic messaging, and Web strategies. Although technology use is expanding rapidly, printed materials still remain a primary tool used by nurses to inform and educate patients.

Doak et al. (1996), pioneers in the area of health literacy, provided clear guidelines for developing easy-to-read materials. The guidelines state that written documents should contain minimal use of medical jargon, have adequate white space to enhance reading, present "how to" information first, and use a font appropriate for the intended audience (i.e., at least 12–14-point font size). Instruments such as the Suitability for Materials (Plimpton & Root, 1994; Wilson, 2000) and the Suitability Assessment of Materials (Doak et al., 1996) provide additional guidance for determining reader appropriateness of printed materials. For patients of all literacy levels, the challenge facing healthcare providers is to supply written health information that is accurate, relevant, attractive, and reader appropriate.

In addition to readability, another aspect to consider in the development and use of printed health education materials is the ethnicity and cultural background of the target audience. Oncology nurses increasingly face the challenges of caring for patients from diverse groups. The Institute of Medicine reported that culturally competent care is an essential element to achieving health literacy (Neilsen-Bohlman, Panzer, & Kindig, 2004). The influence of cultural beliefs can determine patient decision making and behaviors, including those related to cancer treatment. Healthcare providers must strive to understand the culture and diversity of patients with whom they share information and communicate with them in ways they can understand (Hasselkus & Moxley, 2009). Nursing education interventions have a pivotal role in promoting culturally competent care by acknowledging cultural beliefs and helping patients understand essential

information in a manner that ensures confidence and personal dignity during stressful times (Schim, Doorenbos, Benkert, & Miller, 2007). Therefore, pamphlets and brochures should contain the language, logic, and experience of the patients.

## Conceptual Framework

Orem's (1991) self-care theory was the conceptual framework for the current study. Self-care is the practice of activities that individuals initiate and perform on their own behalf for the purpose of maintaining life, health, and well-being. A major concept of the theory, self-care agency, is the patient's ability to engage in self-care. Backscheider (1974) formed a survey list of foundational capacities for self-care that includes learner skills such as reading, writing, communication, perception, and reasoning. Limitations of the skills can impede individuals' capacity for self-care. If limitations exist, nurses who have evaluated the condition can facilitate self-care by guiding patients to reader-appropriate information that meets their education needs. Patients who can assess expected side effects and take action to minimize their impact are engaging in self-care. If the side effects are relieved, patients will be motivated to perform more self-care actions (Rehwaldt et al., 2009).

## Research Questions

The current investigation was conducted in two phases. The following questions guided the study.

- Does a difference exist between self-report of highest grade completed in school and actual reading skills?
- Will participants demonstrate significantly higher knowledge about radiation side effects in relation to their literacy level after reviewing easy-to-read pamphlets?
- Will participants with higher reading skills (7th grade or higher) demonstrate significantly higher knowledge about radiation side effects after reviewing easy-to-read pamphlets than participants with lower levels of literacy (6th grade or lower)?

## Methods

### Research Design and Setting

The current study used a nonexperimental design. The investigation took place in an urban radiation oncology clinic in the midwestern United States that has two sites and serves a large, diverse patient population primarily from the urban area but also cares for patients from suburban and rural areas across the state. The investigation was conducted in two phases. During phase I, the researcher developed easy-to-read, culturally sensitive pamphlets on radiation side effects. In addition, the read-

ability of each pamphlet was evaluated. The pamphlets were field tested in phase II.

### Phase I: Development of Easy-to-Read Pamphlets

The development of the pamphlets was based on information from the literature, Radiation Side-Effect Information (RSEI) cards (Mast & Mood, 1990; Wilson, Mood, Risk, & Kershaw, 2003), and guidelines by Doak et al. (1996) for developing reader-appropriate materials. Although the RSEI cards were composed at a challenging literacy level, the documents contained accurate, substantive information that served as the foundation for the easy-to-read pamphlets. An assessment of the RSEI cards with the University of New England's Area Health Education Center (AHEC) checklist (1996) revealed a mean readability level of 11th grade (SD = 1.35) and a range from 8th grade to postsecondary level. The cards used medical jargon, and the layout and typography were unacceptable, with a small font size of 10 points and no drawings, pictures, or illustrations to convey the message. In essence, the materials were difficult for patients with low-literacy skills to read and understand; the potential difficulty was the primary impetus for developing the easy-to-read pamphlets.

### Phase II: Field Testing the Pamphlets

Phase II of the study was designed to evaluate the effectiveness of the new materials by seeking evidence that patients acquired knowledge and self-care management skills about radiation side effects after reading them.

### Instruments

The **Rapid Estimate of Adult Literacy in Medicine (REALM)** (Murphy, Davis, Long, Jackson, & Decker, 1993) was used to evaluate participants' actual grade level of reading skills. The instrument contains 66 words read aloud by the participant, with the number of correct pronunciations recorded on a separate sheet. The number of syllables per word increases throughout the assessment; therefore, the word difficulty increases as the reader advances through the list. The REALM is user friendly and takes a maximum of 10 minutes to administer. The final score is based on four grade level categories: 3rd grade and below, 4th–6th grade, 7th–8th grade, or high school.

Following an extensive review of the literature, the investigators determined the need to develop the **Knowledge of Radiation Side Effects Test (KORSET)** questionnaire to measure the knowledge level patients gained after reviewing the six easy-to-read radiation side-effect pamphlets. The test items in the questionnaire were derived from the literature, the RSEI cards, and the content of the new pamphlets. The KORSET contains subscales that match the focus of the pamphlets. Examples of test

items include “What does the word fatigue mean to you?” and “Name some things you can do to help you feel less tired.” Items are scored as 1 (correct response), 0.5 (partially correct response), or 0 (incorrect response). A percentage score is calculated from the sum; therefore, scores on the instrument can range from a high of 100% to a low of 0%. Content validity was determined by a panel of radiation treatment experts (oncologists and oncology nurses). The internal consistency reliability coefficient  $\alpha$  for the instrument was 0.82 for subscale A (fatigue), 0.73 for subscale B (skin problems for women), and 0.86 for subscale C (skin problems for men). The subscales fared well with psychometric qualities. Subscale D (loss of appetite,  $\alpha = 0.65$ ) and subscale E (emotional problems,  $\alpha = 0.1$ ) were less than fair, whereas the subscale on infection showed poor reliability ( $\alpha = -0.34$ ). The low reliability scores could be attributed to the small sample size. The results of the current study focus on the three pamphlets demonstrating good internal consistency: fatigue, skin problems for men, and skin problems for women.

### Study Participants for Phase II

A convenience sample (N = 47) was recruited for participation. Eligible patients at the radiation clinic were in the beginning phases of treatment and were mentally and physically able to participate in the study. Exclusion criteria were being younger than 18, unable to speak or read English, or too physically and mentally debilitated to participate. The research focus was describing the literacy and knowledge level of urban oncology clinic patients who evaluated the pamphlets, rather than intervening to improve knowledge or determine effect sizes. Therefore, the investigators did not conduct an *a priori* power calculation or recruit participants based on predetermined literacy or knowledge level groupings (i.e., quota sampling). For future studies, targeted recruitment and adequate sample sizes would be appropriate and necessary.

### Procedure

The investigators obtained institutional review board approval from their university. After approval, phase I of the study, development of the pamphlets, was initiated. The first step was to review current literature regarding radiation side effects and compare it to information in the RSEI cards. The investigators determined that the content of the RSEI cards was accurate, current, and usable as the primary content of the pamphlets. The next step was to write sentences for the pamphlets aimed at a readability level no higher than 5th–7th grade or lower if possible, given that 48% of residents in the urban locale where the study occurred have unacceptable reading levels (Wilson & Ntiri, 2006). Although the investigators recognized that literacy experts consider an 8th-grade readability

## Feel Very Tired Sometimes?

Your radiation treatments may make you feel very tired (**fatigued**). It happens to many people. It does NOT mean that your cancer has returned or is getting worse. It often means that your body is using a lot of energy to fight the cancer and make healthy cells.

Some people also feel very run down or poor. This also is caused by radiation treatments. If you are taking cancer drugs, you may feel even more tired.

### What Can I Do?

- ✓ Rest when you feel tired.
- ✓ Plan your day to save your energy. Do the kinds of things you like to do, but take lots of breaks. Don't overdo.
- ✓ You may feel less tired on the days when you do not have treatments. Don't do too much on these days. Pace yourself.
- ✓ Ask for help from family, friends, healthcare agencies, and other community organizations. They may be able to help with cooking, housework, shopping, child care, transportation, and many other things.
- ✓ Eat a healthy diet. Include foods high in iron, such as meat, chicken, greens, and beans. Also, drink lots of fluids such as water and juice.



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Figure 1. Easy-to-Read Fatigue Pamphlet

level to be acceptable for the general public (Doak et al., 1996), they were developing easy-to-read materials for patients with low literacy. To achieve low-level readability, the investigators used short sentences in conversational style and minimized medical jargon as much as possible. Readability level was assessed with the Flesch-Kincaid readability formula located in the Microsoft® Word for Windows® 2003 (Version 7) word-processing package. The Flesch-Kincaid has strong correlations with other readability formulas when used with health-related information ( $r = 0.91-0.95$ ) (Meade & Smith, 1991). The third step in the development of the pamphlets was to determine the layout and formatting by using guidelines for developing easy-to-read materials. The final step was choosing the illustrations (submitted by a local artist with previous

experience working with the investigators) that best conveyed the message.

Following the development of the pamphlets, a panel of six healthcare professionals with backgrounds in oncology and health-literacy communication reviewed the materials for content and appropriateness. After the reviews, the materials were field tested.

In the beginning of phase II, the research nurse presented an overview of the investigation to eligible patients. Following written consent, participants were administered the REALM and a demographic profile. As part of standard care, oncology nurses in the clinic presented a brief education session on side effects to all radiation recipients during treatment. Patients recruited for the study then were asked to read two pamphlets (paired with randomized numbering). The pamphlets were given to participants to take home and read over a two-week period, deemed by the investigators adequate time to thoroughly review the materials. Following the two-week period, participants were administered the KORSET that corresponded with the two pamphlets they had read. Finally, participants were asked to provide verbal feedback about the pamphlets, including what they liked and disliked about the documents.

## Data Analysis

Descriptive statistics (means and percentage distributions) were calculated to describe and categorize participants according to education and literacy levels. Pearson correlation coefficients were calculated to assess linear associations between knowledge (KORSET) and literacy (REALM), whereas t tests were used to assess differences in mean knowledge scores between lower and higher literacy groups.

## Findings

### Phase I

Six pamphlets were developed during the first phase of the study. The pamphlets focused on loss of appetite, fatigue, emotional problems, infection, skin problems for men, and skin problems for women. Printed on 8.5" x 11" white bond paper, three brochures were trifold and three consisted of two half-fold sheets nested together. In developing the easy-to-read materials, the following characteristics enhanced readability: less complex words, shorter sentences, appropriate writing style (e.g., conversational versus informative, active versus passive voice), illustrations to highlight the text, and attention to layout and typography. For example, the investigators used a font size of 12–14 points and white space around the text and illustrations to reduce the appearance of clutter. Illustrations were hand-drawn black and white sketches depicting the intended message and various cultural groups. Brochure covers were produced in light

shades of vibrant colors such as red, green, and purple to differentiate among topics and appeal to readers. The investigators were able to obtain a 3rd–6th-grade readability level, which was lower than anticipated. A sample of the fatigue pamphlet is shown in Figure 1.

### Phase II

Age of participants ranged from 22–84 years, with a mean age of 47.2 (SD = 15.7). Most were women, African Americans, married, and unemployed, with an annual income lower than \$5,000 (see Table 1).

The first research question focused on whether differences existed between self-report of highest grade completed in school and actual reading skills measured by the REALM. The actual reading level was significantly lower than the self-reported years of education. Although the mean self-reported highest education level was 10th grade, the mean REALM score was 43, equivalent to a 4th–6th-grade reading level (see Table 2). Further analyses showed that only 14 (30%) read at the high school level (grades 9–12), whereas 11 (23%) read at the 7th–8th-grade level, 13 (28%) read at the 4th–6th-grade level, and 9 (19%) read at or below the 3rd-grade level.

Concerning research question two, Pearson moment correlations were used to determine whether a linear association existed between KORSET scores and literacy. Mean KORSET scores were computed by REALM-based literacy level for each of the three content areas with viable pamphlets: fatigue, skin problems for women, and skin problems for men (see Table 3). Scores for each knowledge test increased with literacy level, with statistically significant correlations (all  $p < 0.01$ ) of 0.64 (fatigue), 0.83 (skin problems for women), and 0.72 (skin

**Table 1. Demographic Characteristics**

Characteristic	$\bar{X}$	SD
Age (years)	47.2	15.7
Characteristic	n	%
<b>Male</b>	19	40
<b>African American</b>	32	68
<b>Annual household income (\$) <sup>a</sup></b>		
5,000 or less	19	40
5,000–15,000	9	19
15,000 or more	16	34
<b>Marital status <sup>a</sup></b>		
Married	19	40
Divorced	9	19
Single	17	36
<b>Employment status</b>		
Employed	15	32
Unemployed	24	51
Retired	8	17

N = 47  
<sup>a</sup> Not all participants answered all survey items.

**Table 2. Rapid Estimate of Adult Literacy in Medicine Scores by Self-Reported Years of Education**

Score	Education	
	$\bar{X}$	SD
3rd grade or lower	7.2	2.6
4th–6th grade	9.2	2.9
7th–8th grade	10.7	1.2
9th grade or higher	13.5	2.2

problems for men). As suspected, the lowest scores were found among the participants who read at or below the 3rd-grade level, with mean percentages correct of 41% (fatigue), 46% (skin problems for women), and 47% (skin problems for men); none of the participants scored 100% on any of the KORSETs. Participants who read at the 4th–6th-grade level scored higher than expected based on literature with mean scores of 78% (fatigue), 72% (skin problems for women), and 72% (skin problems for men), suggesting that patients reading at the 6th-grade level and below are considered to have inadequate health literacy and would have difficulty comprehending even low-literacy materials (Murphy et al., 1993).

For research question three, dichotomizing the groups into participants with literacy levels of 6th grade or lower versus 7th grade or higher reinforced that knowledge comprehension and retention are associated with reading ability. For each of the three pamphlets, participants in the higher reading group scored higher on the related KORSET than those in the lower group. Mean difference in scores between the groups was 26.9 percentage points for fatigue ( $t = -2.96, p = 0.01$ ), 24.7 points for skin problems for women ( $t = -3.64, p = 0.001$ ), and 31.8 points for skin problems for men ( $t = -2.3, p = 0.04$ ).

**Participant assessment of pamphlets:** Participants were asked to provide verbal feedback on their assessment of the pamphlets. Three pamphlets (emotional problems, loss of appetite, and fatigue) contained drawings that were unacceptable to patients because the pictures did not clearly present the side effects. Participants gave positive feedback regarding the “look of diversity” in the pamphlets’ illustrations that depicted both African American and Caucasian features. Phrases in the pamphlets such as “family reunion” or “extended family” are concepts common to many diverse groups and were used to convey simple messages. In addition, 90% of participants found the pamphlets easy to read and attractive in appearance and stated they would use the recommended self-care activities for management of radiation side effects. Although evaluation of the pamphlets cannot be linked to knowledge (research questions two and three), participants’ overall acceptance of the pamphlets may have compelled them to review

the materials more carefully at home than traditional printed information.

## Discussion

For the current study’s patient population, the self-reported highest grade completed in school was high school grade level and above. However, the actual mean reading skill based on REALM scores was 4th–6th grade, which means the patients may struggle to understand printed health information written at challenging literacy levels. For example, the RSEI cards were assessed at an 11th-grade reading level (AHEC, 1996). The findings of a difference between reported grade level and actual literacy level are consistent with other studies, suggesting that many adults read three to five grade levels below the highest grade completed in school (Doak et al., 1996). In 1998, the National Work Group on Literacy and Health strongly recommended that written health information be written at the 5th-grade level, yet even that level may be too high for a segment of the adult population.

In the current study, a difference was observed by literacy level in demonstrated knowledge about radiation side-effect management. Patients with higher literacy levels demonstrated higher knowledge about radiation therapy side effects after reading the modified information pamphlets. Patients with a 4th–8th-grade reading level scored better than expected on most of the test items on the KORSET. Patients with reading levels at or below the 3rd grade had difficulty with many of the test items, indicating they were unable to comprehend much of the information; this group had the lowest scores (less than half of items answered correctly) on the knowledge test. When patients have difficulty comprehending even easy-to-read materials, supplemental information such as repeated oral instructions and video or audiotapes may facilitate acquisition of knowledge (Ruthman & Ferrans, 2004; Thomas, Daly, Perryman, & Stockton, 2000).

When patient education materials cannot be written at the 5th-grade level or below because of the complexity of the topic or the need to use medical jargon to convey health information (e.g., generic drug names), nurses

**Table 3. Knowledge of Radiation Side Effects Test for Pamphlets on Fatigue and Skin Problems**

Literacy Level	Skin Problems					
	Fatigue		Women		Men	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
3rd grade or lower	41.1	23.6	45.8	–	47.5	27.4
4th–6th grade	77.7	25.2	72.2	6.4	72.2	8.7
7th–8th grade	89.3	17	79.8	12.4	79.2	17.7
9th grade or higher	93.4	11.8	96.5	6.4	97.9	2.9

may use another strategy in conjunction with the written materials called the teach-back procedure (Schillinger et al., 2003; Wilson, Baker, Nordstrom, & Legwand, 2008). In the teach-back procedure, patients articulate in their own words their understanding of what they were taught by the healthcare provider. The strategy allows patients to restate the key elements from patient teaching. For example, a nurse may teach a patient about fatigue as a side effect of radiation treatment. During the instructions, the nurse would stop several times and say to the patient, "Tell me in your own words your understanding of what I just taught you." The procedure provides immediate feedback for the nurse on which areas need supplemental instructions.

## Conclusion

As with many pilot studies, the generalization of the findings was hampered by the small sample size. Despite the limitation, the current study highlights important issues regarding the development and evaluation of easy-to-read materials. The results of this investigation might provide insight for oncology professionals regarding the need for reader-appropriate materials. Knowledge gained from written pamphlets given to patients can be quantified easily and monitored over time with a specific tool such as the KORSET to ensure continued understanding and to identify topics that require additional teaching.

Although the investigators could not assume that reader-appropriate education materials are the sole answer to the problems of health literacy, giving patients a choice of education materials that best suits their needs is an initial step. The goals of Healthy People 2010 clearly show the national priority leaders in health care place on addressing health literacy. For example, one objective is to "improve the health literacy of persons with inadequate or marginal literacy skills" (U.S. Department of Health and Human Services, 2003, p. 15). Oncology nurses play

an important role in reducing disparities experienced by vulnerable patients by being health-communications advocates and using their assessment and teaching skills to identify comprehension deficits and consistently educate patients during their cancer treatment.

Although nurses provide patients with materials designed for lower reading levels, the current study's findings show that patients with exceptionally low literacy still demonstrate lower knowledge about radiation side effects. The result suggests a need to further test the pamphlets and the KORSET with an intervention specifically designed to enhance the learning of patients with limited literacy.

## Implications for Nursing

Continued nursing inquiry is needed that focuses on the side effects of radiation therapy and self-care behaviors that might minimize the adverse effects. Likewise, reader-appropriate education materials that stress management of side effects are essential to create more informed patients and minimize experiences of disparities, regardless of literacy levels. After assessing patients' learning styles and reading skills, nurses can determine which teaching strategy best fits their patients' needs. William and Schreier (2004) emphasized the use of multiple approaches. In addition to written information, evidence-based instructional methods including audiotapes, interactive media, and the teach-back procedure have been effective in providing instructions about self-care behaviors.

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Digital Object Identifier: 10.1188/10.ONF.774-781

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