

Nutrition Screening and Counseling in Adults With Lung Cancer: A Systematic Review of the Evidence

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Maintenance of adequate nutrition is an integral component of the cancer treatment process. Numerous factors should be considered when evaluating the nutritional status of patients with cancer. A systematic review of the literature revealed the importance of nutrition interventions in patients with cancer who were undergoing chemotherapy. Counseling in nutrition has been shown to improve quality of life, strengthen response to therapy, and increase survival. Lung cancer presents a significant risk as the leading cause of cancer morbidity and mortality in the United States. In addition, nutritional deficiencies are experienced by most adults with lung cancer during the course of their disease and treatment. The deficiencies compound the cost of treatment and also increase morbidity and mortality in this patient population. Further study of nutritional interventions is needed to promote better outcomes and quality of life in patients with lung cancer.

Lung cancer is the leading cause of cancer morbidity and mortality in men and women worldwide (Molina, Yang, Cassivi, Schild, & Adjei, 2008). In 2010, lung cancer will be the leading cause of death, outranking cardiovascular disease (Centers for Disease Control and Prevention [CDC], 2007). Smoking cessation programs have been beneficial in decreasing smoking prevalence, but an associated rise in lung cancer has been observed in former smokers. In a cohort study done from 1997–2002, 60% of newly diagnosed patients with lung cancer were former smokers and only 25% were current smokers (Yang, Allen, & Aubry, 2005). The cost of treatment for lung cancer was \$9.6 billion in 2004 (CDC, 2007). The total burden, including costs of medications and missed time from work, was \$190 billion (CDC, 2007).

Nutritional deficiencies that accompany any diagnosis of cancer can compound the cost of treatment and also increase the risk of morbidity and mortality (Bauer, Capra, & Ferguson, 2002). Nutritional deficiencies can decrease response to therapy, which translates to decreased quality of life and survival (Andreyev, Norman, Oates, & Cunningham, 1998; Dewys et al., 1980). Screening for the deficiencies at diagnosis is important in all patients with cancer and has been shown to be effective in lung cancer (Bauer & Capra, 2005; Brown, 2002; Slaviero, Read, Clarke, & Rivory, 2003).

Nutrition screening is the process of assessing the characteristics and risk factors that will predispose a patient to deficiencies (McMahon & Brown, 2000). To accomplish the screening, a complete nutritional assessment is needed. The recommendation is to start the assessment within 48 hours of admission or diagnosis of cancer and with initiation of therapy, change in therapy, or a weight change of 2%–5% (McMahon

At a Glance

- ◆ Nutrition is an integral aspect of assessment in adults with lung cancer, and screening at the outset of treatment will help to identify patients who are most at risk for significant deficiencies during chemotherapy.
- ◆ Nutrition intervention has been shown to improve response to therapy.
- ◆ Nurses should be aware of the evidence on nutrition screening and counseling in patients with lung cancer to provide management for any deficiencies that become evident during chemotherapy treatment.

& Brown, 2000; Shils, 1979). The information obtained in the screening process should include the following: weight changes, food consumption, functional status, symptoms related to the cancer, and physical examination. Biochemical indicators, such as serum albumin, also are evaluated (McMahon & Brown, 2000).

Many tools can be used to evaluate nutritional status. The scored Patient-Generated Subjective Global Assessment (PG-SGA)

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tool (Ottery, 1996) and Mini-Nutritional Assessment (Guigoz, Vellas, & Garry, 1994) have been used in patients with cancer to determine whether nutritional deficiencies exist that would predispose a patient to malnutrition. Both tools have a malnutrition score that indicates whether a patient is at risk or malnourished. Nurses must be aware of any risk for or evidence of malnutrition to care for patients properly.

The purpose of this review is to highlight the evidence on nutrition screening and counseling in patients with lung cancer. The review will help guide oncology nurses in the importance of evaluating the nutrition status of patients with lung cancer receiving chemotherapy and of the need for counseling of patients and families on how to maintain nutrition status during treatment.

Methods

The author conducted a systematic search of the PubMed, CINAHL®, and CancerLit® databases from 1990–2008. The range of years was chosen to include any sentinel papers on nutrition in patients with cancer. The medical subject heading terms of *lung cancer*, *nutrition*, and *chemotherapy* were entered. The modifier for adult participants only was included. A total of 111 articles were identified; of them, 12 were in a foreign language and thus excluded. Fifty-two articles were excluded as not having to do with lung cancer and nutrition during chemotherapy. After the author reviewed the abstracts provided, another 38 articles were scanned but did not appear to be relevant to the topic of patients with lung cancer receiving chemotherapy; some did not include patients with lung cancer, and multiple articles dealt with nutrition supplements, enteral nutrition therapy, or medication for appetite stimulation, which was not included in the purpose of this review. The 11 articles that remained were used in this review. Hand-searching the articles' references also produced one additional relevant article. The articles were evaluated with the Johns Hopkins Nursing Evidence-Based Practice guidelines for quality and strength of the evidence (Newhouse, Dearholt, Poe, Pugh, & White, 2007). Of the 12 articles, one was a randomized, controlled trial; eight were nonexperimental or qualitative; and three were written by nationally recognized experts or were based on nonresearch evidence. Table 1 contains an overview of the articles.

Review of the Evidence

The review of the evidence revealed that the concern over the nutritional status of patients with cancer undergoing therapy has been and continues to be a challenge. All of the articles commented on the need for monitoring of nutritional status in patients with cancer. Screening for nutritional deficiencies of patients with lung cancer were studied in eight of the reviewed articles. The screening was comprised of biochemical assays, anthropometric measurements, and symptom assessments. In three articles, the PG-SGA was used to establish whether the patient was well nourished, suspected malnourished, or severely malnourished (Bauer & Capra, 2005; Bauer et al., 2002; Khalid et al., 2007). In six articles, weight assessment was done

at baseline and monitored throughout the course of the studies. Anthropometric measurements (i.e., skin-fold measurements and body circumference) were done with the scored PG-SGA and in three other studies to evaluate nutrition status (Harvie, Campbell, Thatcher, & Baildam, 2003; Sarna, Lindsey, Dean, Brecht, & McCorkle, 1993; Slaviero et al., 2003). Symptom assessment was done in all eight studies with baseline nutrition screening assessment.

Nutrition status was evaluated by a dietitian in four of eight studies. The other studies relied on other healthcare providers (physicians or nurses) to assess patients. Diet logs were used in the four studies with dietitian analysis. The diet logs were mentioned as a limitation in two studies because patients or family members may not report food intake accurately. Nutrition counseling was offered in the studies by Bass and Cox (1995) and Ovesen, Allingstrup, Hannibal, Mortensen, and Hansen (1993). Both studies recommended dietary counseling because benefits were seen in patients who received important nutrition information.

The recommendation made in the systematic review by Brown (2002) was to screen at the time of diagnosis to target individuals at greater risk for deficiencies (e.g., patients with more than 5% weight loss within the past month or more than 10% weight loss within the past six months) and to continue to pursue nutrition intervention to promote better nutritional status during treatment. The multifactorial causes discussed in the review by Esper and Harb (2005) and Molina et al. (2008) of the nutritional deficiencies related to cancer make the nutritional deficiencies difficult to treat; different mechanisms require different treatment approaches.

Clinical Implications

Nutrition deficits are prevalent in patients with lung cancer; therefore, recognizing individuals who may be at risk is important. Nutritional deficits are attributable to the type of cancer; location, stage, and grade of the tumor; and metastasis in conjunction with therapy side effects. Patients with more than 10% weight loss at presentation also are at a greater risk for morbidity and mortality (Dewys et al., 1980; Ottery, 1996). At least 33% of patients have 5% weight loss at time of diagnosis, and the weight loss is higher in patients with advanced disease (Ottery, 1996). The pathophysiology of the tumor causes inadequate food intake, metabolic changes, and humoral responses that can lead to cachexia if not treated (Esper & Harb, 2005; Khalid et al., 2007).

The use of a reliable and valid tool to screen and assess patients has been shown to be effective in detecting nutritional deficiencies in patients with lung cancer. The scored PG-SGA facilitates the screening of weight, diet changes, activity level, and symptom distress in conjunction with biochemical analysis and anthropometric measurement (Ottery, 1996). The tool allows for patient or family identification of any concerns but also requires a professional's evaluation of weight changes, chronic conditions, metabolic stress, physical examination (including body composition of fat, muscle, and fluid status), and global assessment categories. The results from the screening can help target patients in need of specific nutrition

Table 1. Review of Literature on Nutrition and Chemotherapy in Lung Cancer

STUDY	DESIGN AND SAMPLE	CONCLUSIONS	LIMITATIONS	RATINGS
Adams et al., 2009	Nonexperimental meta-analysis; systematic evidence review from 2002–2007 of dietary interventions, supplements (eicosapentenoic acid and tryptophan), and pharmacologic interventions (corticosteroids, progestins, thalidomide, cyproheptadine, erythropoietin, metoclopramide, cannabinoids, melatonin, hydrazine sulfate, and pentoxifylline)	Corticosteroids and progestins are recommended for use. Dietary counseling is likely to be effective.	A clear definition of anorexia, tools to measure it, and a better understanding of its mechanism are needed.	Strength: III Quality: A
Bass & Cox, 1995	Nonexperimental survey; 106 adult patients with cancer (breast, lung, and gastrointestinal) early in their treatment regimen from three centers in Virginia T test was used to compare nutrient intake from diet versus supplements. Three-day food records were used to collect information and entered into the Nutritionist IV® computer program.	Patients with cancer had substantial dietary deficiencies (calcium, magnesium, zinc, and copper); 31% were counseled by a healthcare team member, and 9% had a registered dietitian consult. Most (60%) were not counseled; of them, 33% wanted counseling. Patients with cancer used fewer supplements than in a 1985 U.S. Food and Drug Administration survey.	The sample was nonrandom and biased; further investigation is needed.	Strength: III Quality: C
Bauer & Capra, 2005	Nonexperimental, descriptive; 8 patients with pancreatic or NSCLC were asked to consume at least one can of protein and energy-dense oral supplement between meals. Patients were assessed at baseline, four weeks, and eight weeks by SGA and PG-SGA. Patients kept a food diary over three days. QOL was measured with the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire.	Patients had significant improvement in total protein, energy, fiber intake with counseling by a dietitian, and the use of oral supplements. Significant improvement also was observed in nutritional status, Karnofsky performance status, QOL, weight, and lean body mass.	Small sample size; one patient dropped out because of disease progression.	Strength: III Quality: B
Bauer et al., 2002	Nonexperimental, descriptive; 71 hospitalized patients aged 18–92 years with breast, prostate, esophagus, or lung cancer and lymphoma, sarcoma, and myeloma A dietitian classified patients as well nourished, moderately or suspected malnourished, or severely malnourished. Kruskal-Wallis test compared median PG-SGA score and median length of stay. Chi-square tests assessed the relationship between nutritional status and readmission or death within 30 days of hospitalization. Correlational analysis was conducted between PG-SGA score and percentage of weight loss in six months and BMI. Logistic regression assessed predictors of mortality.	On the SGA, 24% were well nourished, 76% were malnourished, 59% were moderately malnourished, and 17% were severely malnourished. A significant difference ($p < 0.001$) was found between SGA and PG-SGA scores in severely malnourished patients. The PG-SGA had 98% sensitivity and 82% specificity. The PG-SGA is a quick, valid, and reliable nutrition tool.	Selection bias because of convenience sample	Strength: III Quality: B
Brown, 2002	Metasynthesis; phase I of the Oncology Nursing Society PRISM (Priority Symptom Management) study Medical subject heading terms were <i>neoplasms, cachexia, anorexia, weight loss, diet therapy, megestrol acetate, and exercise</i> . Of 28 randomized controlled trials from 1981–1990, only one pertained to anorexia or cachexia. The 15 studies on pharmacologic interventions tested four drugs for cancer cachexia: progestin agents, corticosteroids, hydrazine, and cyproheptadine. In addition, 18 studies reviewed physical activity (15%–20% energy expenditure and 60%–75% metabolism).	Nonpharmacologic trials that increased caloric intake showed no improvement in nutritional status, weight, tumor response, survival, or QOL. Weight, appetite, and well-being increased with megestrol acetate, but nutritional status did not change. Nutritional assessment, interventions to improve food intake, decreased energy expenditure, and minimization of negative energy balance are recommended.	—	Strength: III Quality: A
Esper & Harb, 2005	Qualitative; review of metabolic and clinical manifestations of cancer: (a) anorexia from mechanical obstruction, nausea, vomiting, pain, depression, or anxiety and (b) cachexia from early satiety, anorexia, weight loss, tissue wasting, weakness, impaired immune system, or poor physical performance	Cachexia was associated with increased morbidity and mortality. Abnormalities were observed in multiple pathways.	—	Strength: IV Quality: A

(Continued on next page)

ANOVA—analysis of variance; BMI—body mass index; MNA—Mini-Nutritional Assessment; NSCLC—non-small cell lung cancer; PG-SGA—Patient-Generated Subjective Global Assessment; QOL—quality of life; SCLC—small cell lung cancer; SGA—Subjective Global Assessment

Table 1. Review of Literature on Nutrition Counseling in Lung Cancer (Continued)

STUDY	DESIGN AND SAMPLE	CONCLUSIONS	LIMITATIONS	RATINGS
Harvie et al., 2003	Nonexperimental, descriptive; 21 patients (15 men and 6 women) with NSCLC receiving chemotherapy; 50 others were lost because of acuity, death, and receiving supportive therapy alone. Fat-free mass was assessed prior to treatment and one month after completion. Paired t test measured changes from baseline until completion of treatment.	Minimal weight changes were observed in men and women. Men had increased body fat and decreased fat-free mass. Women had no change in body fat or fat-free mass.	The sample was small. Acuity and loss to progression in the 50 original patients was high because of advanced NSCLC.	Strength: III Quality: C
Khalid et al., 2007	Nonexperimental; 151 patients (85 men and 66 women; 122 with gastrointestinal malignancy and 29 with lung malignancy) The PG-SGA was used to record symptoms. Mann-Whitney and chi-square tests compared groups on number and type of symptoms, food intake, weight loss, and performance status. Spearman's correlation compared weight changes and number of symptoms as well as weight change and tumor volume.	Most patients (62%) had one or more symptoms at presentation. Loss of appetite was more significant in patients with lung cancer. No correlation was found between weight loss and tumor burden. In the past six months, 33% of patients had more than 10% weight loss.	Researchers may have missed other important symptoms, and self-reporting may have caused inaccuracies.	Strength: III Quality: B
Molina et al., 2008	Metasynthesis; risk factors were smoking (cigarette and secondhand), alcohol, air pollution, food supplementation, occupational exposure, and susceptibility genes. Protections were diet, exercise, and physical activity. Staging, screening, treatment (surgery, chemotherapy, targeted therapy, and radiation therapy) were reviewed. Prognostic indicators for survival were tumor cell grade and differentiation, smoking cessation, dietary supplements, tumor markers, and pharmacologic and treatment outcomes.	NSCLC has a five-year survival rate of 15%. Incidence continues to rise in China but has declined in the United States and other countries. NSCLC is more predominant in former smokers than current smokers. Targeted therapy has improved response rates in NSCLC.	—	Strength: III Quality: A
Ovesen et al., 1993	Randomized, controlled trial; 105 participants with verified SCLC, ovarian cancer, or breast cancer, assessable disease, life expectancy more than three months, and Eastern Cooperative Oncology Group performance status higher than 2 Patients were randomized to receive nutrition counseling by a dietitian (n = 57) or only physician support (n = 48) during treatment. Patients were counseled biweekly for two months. ANOVA and chi-square tests compared weight change and QOL. Three-day diet logs were analyzed with Danish food composition tables. QOL was assessed with the QOL index.	Dietary counseling increased daily energy and protein intake in the treatment group but not in control. Counseling did increase weight, but the increase was not statistically significant. Triceps skin-fold measurements significantly increased. Both groups had equal tumor response and increased QOL. No overall survival advantage was observed in the counseled group (1 year: 69% counseled versus 72% control; 2 year: 39% counseled versus 32% control).	Food intake may have been over-reported by either group.	Strength: I Quality: A
Sarna et al., 1993	Nonexperimental, descriptive, longitudinal study; 28 patients with progressive lung cancer Three-day diet records were analyzed with the U.S. Department of Agriculture Nutrient Database. Body weight, hunger, symptom distress, and functional status were measured every six weeks starting at two months after diagnosis. T test assessed weight loss at baseline, age, type of lung cancer, treatment, comorbidities, and presence of disease. Pearson correlation coefficients were used for hunger, appetite disruption, nausea, symptom distress, functional status, weight change, and nutritional intake.	With significant weight loss at onset, dietary assessment was important, particularly with chemotherapy treatment. Lower kilocalorie intake was related to functional status. Constant disruption in appetite was observed. Weight loss was greater in patients who were younger than 65 years, had SCLC, and were receiving chemotherapy. At the start of the study, 86% had comorbidities (cardiovascular disease, pulmonary, renal) and 39% had lost more than 10% body weight.	Small sample size and attrition (nine completed the study)	Strength: III Quality: B
Slaviero et al., 2003	Nonexperimental; 73 patients with advanced (lung, breast, and prostate) cancer from July 2000–April 2002 Spearman's correlation assessed weight changes over three months. Mann-Whitney U test was used for effects of age, gender, and nutrition parameters. Kruskal-Wallis ANOVA variance measured differences between variables of weight change and MNA.	Baseline weight loss and MNA score were strongly correlated. Weight loss and MNA score were significantly correlated with C-reactive protein level. Weight change at baseline had a negative association with C-reactive protein and inflammatory markers. Decreased serum albumin concentration correlated with weight loss. BMI does not provide adequate information on nutrition.	The MNA is not as sensitive as the PG-SGA.	Strength: III Quality: B

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counseling. Nurses can be instrumental in implementing the evaluation of patients with lung cancer by using the PG-SGA, as well as in monitoring patients' biochemical assays of serum albumin and protein. Discussion of patients' calorie and protein intake on visits to the hospital or clinic can help to determine their daily intake and balance it in relation to their energy expenditure.

The first law of thermodynamics indicates that increased energy expenditure is equal to the amount of energy added to the system minus the energy expended. In the cancer process, fat and lipid metabolism is altered with hypermetabolism, which results in decreased energy in the system along with higher levels of energy expended (Esper & Harb, 2005). Patients with lung cancer also have a higher resting energy expenditure, which results in higher caloric needs. The process causes the wasting syndrome seen in patients with cancer. Understanding the underlying causes of nutritional deficiencies allows nurses to promote the most efficacious food sources to counteract cancer and treatment side effects. Promotional literature can be given to the patients and family to review at home but also should be discussed with them to make sure of their understanding. Diet sheets with high calorie and high protein sources should be distributed for quick reference. The use of high calorie supplements for days when patients' appetites are diminished has been shown to be helpful (Bauer, 2005).

As is the case with any patient undergoing therapy, ascertaining the degree of adverse side effects that patients are experiencing is important. Targeting the side effects quickly can help to counteract potential nutritional deficiencies caused by poor intake. Adverse events will not be discussed in this review. Additional study is warranted on the most effective counseling interventions. The structure of the interventions should be well documented to allow for replication of effective measures. Unfortunately, none of the studies reviewed documented what literature was used with the patients or how the counseling was organized.

Conclusion

Nurses are integral in the screening, ongoing assessment, and counseling of patients with cancer in general and patients with lung cancer in particular. Targeting specific patients through screening and counseling may provide a significant benefit to their nutrition status and improve their quality of life. As always, nurses should report their findings to promote exemplary care through evidence-based practice.

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