Dyspnea is a common and often overlooked symptom in patients with lung cancer. Oncology nurses are positioned to promptly assess, triage, and intervene to minimize dyspnea, but improved assessment is needed. As a result, this pilot study explores the validity and feasibility of two assessment scales on measuring the perception of dyspnea in patients with non-small cell lung cancer in the acute care setting.

Dyspnea remains an under-recognized and distressing symptom for patients coping with non-small cell lung cancer (NSCLC). Dyspnea is reported in almost 60% of patients with lung cancer (Beckles, Spiro, Colice, & Rudd, 2003). Oncology nurses caring for patients with dyspnea must promptly assess, triage, and intervene to minimize the often frightening sensation. Dyspnea is defined as a subjective experience of difficult, labored, and uncomfortable breathing that occurs when the demand for ventilation exceeds individual ventilation capacity (Brown, Carrieri, Janson-Bjerklie, & Dodd, 1986). Dyspnea, which impacts up to 70% of patients with cancer during their last four weeks of life (Reuben & Mor, 1986), is a complex issue consisting of physical, emotional, functional, and psychological factors (Joyce, McSweeney, Carrieri-Kohlman, & Hawkins, 2004; O’Driscoll, Corner, & Bailey, 1999).

The oncology clinical nurse specialist at a community-based hospital identified the need to improve the process for assessing and managing dyspnea in patients with cancer receiving acute care. A better understanding of the mechanisms, assessment, and treatment of dyspnea is needed for clinicians to improve their ability to monitor and treat patients (American Thoracic Society [ATS], 1999). Given appropriate tools, the nurse is in position to gain a more insightful view of the patient’s experience through subjective and objective data. In addition, thorough assessment of dyspnea may lead to more suitable and effective interventions to minimize patient distress. The oncology clinical nurse specialist coordinated a project team of nursing staff to address dyspnea; the study project and results are the focus of this article.

This exploratory pilot study was aimed to examine the validity and feasibility of the Numeric Rating Scale (NRS) and the ATS Grade of Breathlessness Scale on measuring the perception of dyspnea in patients with advanced NSCLC in the acute care setting. The study also was aimed to explore different interventions employed by oncology nurses based on patients’ NRS scores to examine influencing variables of age, gender, ethnic origin, comorbidities, and smoking status on patients’ perceptions of dyspnea.

**Literature Review**

**Lung Cancer**

NSCLC accounts for about 75%–80% of all lung cancers in the United States (Houlihan, 2004). About 90% of patients with NSCLC experience moderate to severe dyspnea before death (LeGrand & Walsh, 1999). Lung cancer has a delayed presentation because its signs and symptoms usually develop once the tumor is large enough to interfere with normal lung function or the tumor has spread to distant areas and causes issues such as pain from bone metastasis (Tyson, 2004). Eighty-seven percent of patients with NSCLC experienced breathlessness as a serious symptom of their disease (Holien, Gralla, Kris, Eberly, & Cox, 1999). Patients with lung cancer experience increasing issues with breathing, decreased sense of vitality, and increased psychological distress throughout their disease trajectory (Specht-Ryan, 1996). Dyspnea is more common among patients with lung cancer than the cancer population in general (Houlihan, Inzeo, Joyce, & Tyson, 2004). Causes of dyspnea in this population may include direct tumor invasion of the lung parenchyma or airways or indirect complications such as pleural effusions, pneumonia, side effects from chemotherapy or radiation therapy, or comorbid conditions (e.g., chronic obstructive pulmonary disease, heart failure, pulmonary embolism) (Wickham, 2002).
Dyspnea

The sensation of dyspnea seems to originate with the activation of sensory systems involved with respiration (ATS, 1999). Dyspnea is linked to three main abnormalities: (a) an increase in respiratory effort to overcome a certain load (e.g., pleural effusion), (b) an increase in the proportion of respiratory muscle required to maintain a normal workload, and (c) an increase in ventilatory requirements (e.g., metabolic acidosis, anemia) (Ripamonti & Bruera, 1997). Some abnormalities may coexist simultaneously in patients with a cancer diagnosis, thus making dyspnea more complex to interpret in the clinical setting.

The distressing feeling of dyspnea alerts the cortex of a potential threat, which leads to behaviors that battle to maintain homeostasis (Wickham, 2002). The intensity of the experience cannot be adequately predicted by respiratory rate or the degree of lung dysfunction (Edwards-Hood & Harwood, 2004). Patients with comparable degrees of lung impairment may perceive considerable differences in intensity of dyspnea (Ripamonti & Fusco, 2002). As a result, dyspnea is sensitized, totally perceived, interpreted, and rated by the individual experiencing it (Brown, 1985; Brown et al., 1986).

Minimal nursing research has investigated dyspnea in patients with cancer. Brown et al. (1986) found that the descriptors most frequently used by patients with lung cancer were “difficulty breathing” and “shortness of breath.” In addition, 97% of patients described the chest as the location of their sensation, as well as emotional feelings that accompanied the sensation such as anger, anxiety, and fear (Brown et al., 1986). In a qualitative study, Roberts, Thorne, and Pearson (1993) found that, although dyspnea seems to be a significant symptom in late-stage cancer, it often remains unreported by patients and unnoticed by healthcare professionals.

Dyspnea Assessment

The degree of intensity or severity of a patient’s dyspnea may be measured with several assessment scales (ATS, 1999; Borg, 1976; Gift, 1989; Lareau, Carrieri-Kohlman, Janson-Bjerklie, & Roos, 1994; Mahler, Weinberg, Wells, & Feinstein, 1984; Ripamonti & Fusco, 2002). However, no gold standard exists for measuring a patient’s intensity or severity of breathlessness.

The visual analog scale (VAS) has been used extensively in the measurement of subjective experiences (Mahler, Harver, Rosiello, & Daubenspeck, 1989) but is difficult for some patients to use. VAS is sensitive with demonstrated reliability and validity as a measure of dyspnea (Brown et al., 1986; Gift, 1989; Gift & Narasavage, 1998; Janson-Bjerklie, Kohliman-Carrieri, & Hudes, 1986; McCord & Cronin-Stubbbs, 1992). The VAS can be a 100 mm vertical line with anchors at each end; the patient is asked to indicate the intensity of dyspnea by marking the line.

Bruera, Schmitz, Pither, Neumann, and Hanson (2000) used VAS to rate the dyspnea, anxiety, and fatigue or tiredness of 135 patients with cancer. Results suggested that the intensity of dyspnea and anxiety were higher in patients who experienced moderate dyspnea (Bruera et al., 2000). To date, inpatient oncology unit nursing staff use computerized documentation for nursing assessments, and adapting the VAS into a computerized format may be a challenge. Therefore, this study used the NRS to assess dyspnea because, if effective, the NRS can be integrated into the computerized documentation system for nursing use and may increase adherence with documentation of dyspnea assessment.

Other pragmatic concerns include accurate reproduction of the instrument itself and possible distortion of the length of the line after photocopying (Wewers & Lowe, 1990). VAS scores tend to correlate positively with scores on 10-point verbal scales (Carlsson, 1983; Downie et al., 1978; Elton, Burrows, & Stanley, 1979). NRS demonstrated high correlations with the VAS and is supported as a valid measure for dyspnea (p > 0.05 and t = 0.74, respectively) (Gift & Narasavage, 1998).

The ATS Grade of Breathlessness Scale (1978) is a six-point instrument that grades dyspnea from 0 (no shortness of breath) to 5 (too breathless to leave the house) in relation to the degree of limitation of physical activity. Concurrent validity of the ATS scale with the VAS has been reported (Janson-Bjerklie et al., 1986). Janson-Bjerklie et al. (1986) asked 68 patients with emphysema-bronchitis, asthma, and cardiovascular and restrictive disease to recall physical and emotional sensations during episodes of acute dyspnea; the correlation between the usual VAS scores and the ATS scores across the total sample (r = 0.4; p = 0.001) provided evidence for concurrent validity of the VAS.

Dudgeon and Lertzman (1998) conducted a prospective study assessing VASs for shortness of breath, anxiety, bedside spirometry, maximum inspiratory pressure, chest radiography, arterial blood gases, hemoglobin, and electrocardiogram, if indicated, in 100 terminally ill patients with cancer. Forty-nine percent had lung cancer, whereas 29% had evidence of cardiac ischemia, recent or current myocardial infarction, or atrial fibrillation. Patients had a median of five different abnormalities that could have contributed to their shortness of breath.

Tanaka, Akechi, Okyama, Nishiwaki, and Uchitomi (2002) studied the prevalence and screening of dyspnea in ambulatory patients with lung cancer by using the Cancer Dyspnea Scale and the Dyspnea Numeric Scale. A total of 157 outpatients with advanced lung cancer completed the two scales along with a questionnaire about interference with life activities; fifty-five percent experienced clinical dyspnea. Both scales were found to be feasible in screening for clinical dyspnea (Tanaka et al., 2002).

LaVoie-Smith et al. (2001) evaluated quality of life and dyspnea in patients with lung cancer and the relationships among quality of life, dyspnea, trait anxiety, and body consciousness. Outpatients (n = 128) with stage 1–IV lung cancer participated in the study; 87% experienced dyspnea. Patients with high dyspnea scores also had lower quality of life (p = 0.04) (LaVoie-Smith et al., 2001). Van der Molen (1995) advocated for the use of more than one instrument to measure dyspnea in patients with advanced cancer. Although numerous studies have investigated dyspnea assessment methods for other chronic illnesses, such as chronic obstructive pulmonary disease, asthma, and emphysema (Beauford, Saylor, Stansbury, Avalos, & Light, 1993; Gift, 1991; Janson-Bjerklie, Ferketich, Benner, & Beckner, 1992; Masood, Reed, & Thomas, 1995; Moody, McCormick, & Williams, 1990), nursing research is limited in lung cancer. Given that cancer is a chronic illness, patients should be routinely screened for the presence of baseline dyspnea in addition to acute exacerbations, which may lead to hospitalization. Nursing research is needed.
to investigate the systematic assessment and reassessment of dyspnea in patients with advanced NSCLC to evaluate response to interventions.

Sample and Methods

This project was approved by the institutional review board. The study accrued a convenience sample of 25 participants admitted to the inpatient oncology unit with advanced NSCLC in a community-based rural hospital. Prior to study implementation, the project team conducted a retrospective chart review of patients diagnosed with cancer who reported dyspnea; the team audited 21 charts over a two-month period. Nine of 21 patients had a diagnosis of NSCLC; therefore, the team chose to perform the pilot work with this population. Participants received the assessment scales in their assigned inpatient room at bedside by a project team member.

Training sessions were held with the project team by a nurse researcher consultant from the hospital health system’s nursing research center. Training included roleplaying scenarios for the clinical nurse specialist and project team of administering the NRS and ATS scale, completing participant demographic sheets, obtaining consent, completing the nurse evaluation survey, and scoring the results for the scales. Meetings with the nurse researcher consultant were held periodically to review the interventions, discuss recruitment and study issues or concerns, evaluate progress, and brainstorm for solutions to any identified study challenges.

Instruments

The NRS, a 0–10 numeric scale, was used to assess perception of current dyspnea. The anchors at the end of the scale are 0 (no shortness of breath) and 10 (shortness of breath as bad as can be). Respondents were asked to circle the number that best indicated their intensity of dyspnea at that moment. If the patient could not circle the number, the nurse recorded the response.

Usual dyspnea was measured with the ATS scale, which focuses on the patient’s report of dyspnea experienced while walking distances on a level or climbing stairs, with low scores on the scale indicating greater dyspnea (Gift & Narsavage, 1998). If participants were unable to complete the scale independently, the nurse recorded the responses.

An investigator-developed demographic and health characteristics form collected information from participants related to gender, age, medications, medical conditions, occupation, and smoking status. A nurse-completed intervention form collected data from the project team regarding standard care interventions that were used for participants. Finally, a nurse-completed evaluation survey developed by the investigators was used by project team nurses to evaluate the feasibility of using the NRS and ATS in clinical practice to assess dyspnea in patients with advanced NSCLC.

Methodology

The project team nurse described the study to eligible and interested participants, then had them read the consent form and provided time for review and answering of questions at bedside. After informed consent was obtained, participants were given the NRS immediately and the ATS scale within 24 hours. The project team nurse then completed the demographic and health characteristics form by obtaining information from the patients’ charts and interviewing them. If the NRS score was not 0, the nurse provided standard care interventions to relieve dyspnea. For example, if the patient reported experiencing current dyspnea on the NRS, the nurse elevated the head of the bed or administered an opioid. The project team nurse recorded any interventions employed on the nurse-completed survey form. The nurse then checked for completeness and placed all forms, including the participant-tracking sheet, in a folder labeled with the participant’s identification number that was stored in a locked file drawer.

Data Analysis

Descriptive statistics were used to summarize the participants’ demographic and health characteristics and the nurse evaluation survey. Data were collected from 25 patients. Inclusion criteria were (a) having advanced NSCLC (unresectable) at stage IIIA or above, (b) being aged 40 years or older, and (c) being able to read, write, and understand English. Patients were excluded if brain metastasis was present. Thirteen participants were men (52%); most (96%) were Caucasian and were either married (52%) or a widow or widower (32%). Mean age of the sample was 69.8 years (SD = 10.1). Seventeen (68%) participants had a history of smoking tobacco; six (24%) were still smoking at the time of the study, and five of the six were attempting to quit. Years of smoking tobacco ranged from 25–65 years (X = 32 years). Comorbidities included chronic obstructive pulmonary disease (32%), diabetes (24%), emphysema (20%), asthma (16%), and plural effusion (16%); 16 (64%) had 0–1 comorbidities, and 9 (36%) had 2 or more.

Data were analyzed with SPSS® version 15.0. As both scales measured the experience of breathlessness, construct validity was demonstrated by showing the relationship between the ATS and the initial NRS. The ATS is an ordinal scale that reflects a rank order; therefore, Spearman’s rank-order correlation coefficient was used. A moderate strength correlation (rho = 0.47; p = 0.02) was found. Feasibility was demonstrated by nurse rating of the simplicity and ease of scale use. All nurses (N = 4) rated both scales as simple to administer and explain to patients. In addition, all nurses reported that the two scales adequately informed them of the extent of their patients’ current dyspnea (NRS) and usual dyspnea (ATS scale). The NRS assessments (96%) were performed in 10 minutes or less, and 92% of ATS evaluations were performed in 10 minutes or less. In addition, 22 participants (88%) had no difficulty completing either scale.

Five participants (20%) indicated no dyspnea on the NRS and were offered no intervention. Of the remaining 20, 14 (70%) had NRS scores of 5 or higher prior to intervention. Interventions used in at least 50% of participants included elevating the head of the bed (86%), applying oxygen (57%), and offering hot coffee or tea (57%) and emotional support (50%) (see Table 1).

The ATS scale was used to represent the perception of dyspnea for this analysis, as the scale reflects the overall dyspnea experience. Spearman’s rank-order correlation coefficient was used to examine the relationship between age and ATS scores, with a nonsignificant inverse correlation (rho = −0.018) found. Pearson chi square was used to examine gender difference in ATS scores, and no significant difference was
found between scores of men and women. In examining the difference in ATS scores, 72% of smokers and former smokers versus 29% of nonsmokers reported ATS scores higher than 4. Mann-Whitney U test revealed a significant difference between the two groups (p = 0.041). The groups were not significantly different in regard to age or gender.

Pulmonary-related comorbidities were examined for their relationship to ATS scores with chi square analysis and a cut-point score of 3, representing a low sense of dyspnea. Fifty-three percent of participants with emphysema versus 13% of those who had chronic obstructive pulmonary disease had ATS scores of 3 or lower (p = 0.011). In addition, 100% of participants with emphysema versus 50% of those without emphysema had ATS scores of 3 or higher (p = 0.041). No significant difference was observed in ATS scores between patients who had asthma and pleural effusion, perhaps because of the relatively small number of participants with those diagnoses.

Secondary analysis addressed whether patients who had higher scores on the ATS scale tended to underrate their current dyspnea, as indicated by the NRS. Logically, patients whose ATS scores were higher would be more likely to score higher on the initial NRS as well. The sample was split by ATS scores, with scores of 0–3 categorized as low (n = 10) and scores of 4 and 5 categorized as high (n = 15). An independent samples t test was conducted examining the difference between the groups for the initial NRS scores; no significant difference was found. Because of the small group sizes, statistical power only was 0.54, indicating the need for replication with a larger sample size to avoid possibility of making a type II error.

Limitations

As a pilot study, this work focused on feasibility of the assessment tools in practice. Therefore, the study was limited by the small sample size. The study was set in one acute care setting using patients with NSCLC; findings may be different in patients seeking care in the ambulatory setting or with other cancers causing dyspnea. Another limitation is that treatment modality was not captured in the data set; therefore, patients with NSCLC actively receiving treatment (e.g., chemotherapy) may reveal different results. The study should be replicated with a larger sample size to ascertain if routine usage of the two assessment tools leads to timely assessment and reassessment by the oncology nurse. Replication also should explore frequently used interventions employed by oncology nurses and assess their effectiveness in clinical practice.

Nursing Implications

Oncology nurses should be aware of dyspnea in patients with lung cancer and use appropriate assessment tools to identify and assess this often underrecognized symptom. Results from the current study suggest that use of evidenced-based clinical assessment tools (the NRS and ATS scale) are feasible in an acute care inpatient setting. The current study also investigated the array of interventions used by oncology nurses to manage dyspnea. Investigative work must continue in this area of symptom management so that patients with dyspnea can be managed promptly and appropriately with evidence-based practice.

As a result of this pilot work, the project team will work with the nurse research center at the institution to conduct a study with a larger sample in collaboration with the other two system hospitals to generate additional data regarding outcomes of interventions employed by oncology nurses to manage dyspnea. The ultimate goal is incorporation of the scales into the institution’s computer documentation system.

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References


Bruera, E., Schmitz, B., Pither, J., Neumann, C., & Hanson, J. (2000). The frequency

Table 1. Frequency of Nursing Interventions Used for Patients Reporting Dyspnea

<table>
<thead>
<tr>
<th>INTERVENTION</th>
<th>NRS ≥ 5 (N = 14)</th>
<th>NRS &lt; 5 (N = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevate head off bed.</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Apply oxygen.</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Offer hot coffee or tea.</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Offer emotional support.</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Reposition patient.</td>
<td>5</td>
<td>–</td>
</tr>
<tr>
<td>Coach to purse lips.</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Titrate oxygen.</td>
<td>4</td>
<td>–</td>
</tr>
<tr>
<td>Nebulizer administration</td>
<td>4</td>
<td>–</td>
</tr>
<tr>
<td>Other (e.g., chest tube placement, incentive spirometry)</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Opioid administration 2 1
Inhaler administration 2 1
Use of fan 3 –
Steroid administration 2 –
Use of distraction 2 –
Antianxiety medication – 1
Diuretic administration 1 –

NRS—Numeric Rating Scale

Note. Scores ranged from 0 (no shortness of breath) to 10 (shortness of breath as bad as can be).


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