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Dyspnea Management in Early Stage Lung Cancer: A Palliative Perspective

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Introduction

Virtually unheard of before the last decade, ES-NSCLC survivors have become part of a growing population. Currently comprising 15% of the 221,000 newly diagnosed lung cancers in 2011, the National Cancer Institute (NCI) cites improved screening and increased public consciousness in allowing the medical community to offer this group a chance of curative intervention; something practically nonexistent in lung cancer^{5,6}. Approximately 32% of these individuals have a stage I or II disease, the focus population for this article. Amounting to an approximately 50% five-year survival rate at stage IA–B, and averaging 30% for stages IIA–B^{7–9}, newly diagnosed patients with ES-NSCLC warrant treatment methods that employ an interdisciplinary approach. It is only through comprehensive assessment, interdisciplinary management and surveillance, that the palliative team will demonstrate sound clinical strategies, enhancing the QOL for these patients and their families¹⁰.

Often referred to as the 6th vital sign by leading authorities, dyspnea is defined as respiratory demand exceeding the body's ability to meet that need^{6,7,11}. It is a subjective or perceived, sensory, varied, and yet common experience in lung cancer patients. It is associated with a conscious sensation of uncomfortable breathing, smothering or suffocating, difficult or labored breathing, inability to get enough air, or tightness in the chest^{1,11}. It differs from tachypnea (increased respirations) or breathlessness, which can be a normal physiological response as seen in exercise or a state of excitement¹¹. Dyspnea varies in intensity, consisting of an interface among physiological, psychological, social, and environmental factors, inducing secondary responses^{11,12}. In the clinical presentation chronic, labored breathing is one of the most difficult symptoms to identify or manage, and once acquired, it promises to remain an ever-present condition. Dyspnea possesses unique characteristics in

that acute episodes, such as asthma or bronchitis, are manageable, and tend to subside and resolve with uncomplicated or minimal intervention of the underlying cause. Chronic cases are persistent, linger, and have varied intensity, regardless of intervention. In chronic dyspnea, 85% of the etiologies stem from cardiopulmonary and psychogenic causes¹³. The American Thoracic Society (ATS) suggests the prevalence ranges from 55% – 87% in all stages of lung cancer.

The sensation of breathlessness is frightening to patients and their caregivers (CGs) lending to a feeling of suffocation and possible death. Not only is dyspnea an alarming, multidimensional symptom, the impact on a patient's QOL is undeniable and often incessant^{4,11,14}. Cognizant of the needs of these individuals, it is the palliative care nurse, possessing a specialized skill set, who is poised as the point person in coordinating care, and is a critical component of the interdisciplinary healthcare team.

Along with the diagnosis of ES-NSCLC, 60% of these patients suffer co-morbid conditions and symptoms, such as COPD and dyspnea¹⁵. The plan of care should encompass pharmacological and non-pharmacological interventions for pre-existing medical concerns, along with those issues imposed by lung cancer or cancer treatments. Supportive and palliative care is an essential ingredient in ES-NSCLC patients with dyspnea. The following discussion addresses the etiology, assessment, management, and follow up for the symptom of dyspnea in ES-NSCLC patients.

Clinical Characteristics and Etiology of Dyspnea in Early Stage Lung Cancer

The most common symptom in all lung cancers, dyspnea is one of the most unpleasant, and is described subjectively, and according to the underlying cause. The etiology of dyspnea can be direct or indirect (as seen in TABLE 1). A direct cause of dyspnea involves cancer, or its effects, such as tumor or lymphatic invasion, effusion, obstruction of pulmonary tissue, or the complication of pulmonary embolism^{14,16,17}. Indirect causes are numerous, such as anemia, underlying cardiac or pulmonary disease, thoracic surgery, or cancer treatments such as chemotherapy, biotherapy, and radiation.^{16,17}

Dyspnea often displays similar characteristics but is unique due to the underlying etiology and body system involved (i.e. pulmonary or cardiac). It is frequently classified by the severity, symptomology, type, duration, distress to the patient, and interference with ADLs.^{18,19} The pathophysiology is certainly poorly understood^{16,20} and etiologies are varied as shown in TABLE 1. Dyspnea stems from the mechanisms of increased ventilatory demand, impaired mechanical responses, or a blending of both⁴. Variations exist in the extent of dyspnea due to various afferent causes from the brain's autonomic center or the receptors in the airway, lungs, and chest wall. Further contributors to the variability of dyspnea are the type of provocation such as situation, behavioral influence, and the patient's ability to depict the sensation^{13,19}.

Breathlessness is unique in the sense that there are no specialized dyspnea receptors, although more recently, MRI studies have revealed mid brain arenas exhibiting a "perception" of dyspnea¹⁶. The reaction is likely a consequence of a complex interaction between chemoreceptor stimulation, mechanical abnormalities in breathing, and the perception of the abnormalities by the CNS, or neuromechanical uncoupling¹⁶. Essentially, dyspnea results from the cortex dominating the respiratory center, rousing chemoreceptors in the lung and respiratory muscles. Respiratory effort intensifies, and there is a boost in the use of respiratory muscles. This amplifies ventilatory requirements, and can occur acutely, as in exercise or exertion, or chronically, as with COPD.^{6,21}

Quality of Life Related to Dyspnea in Early Stage Lung Cancer

A rapidly growing population of survivors brings with it expectations of an enhanced QOL, along with a greater emphasis on patient-centered issues. The goal of palliation is to improve patient care by managing symptoms in the physical, psychological, social, and spiritual realms associated with lung cancer and/or its treatment^{22,23}. Palliative intervention should be received concurrently with treatment and continue as long as needed.

Current literature clearly demonstrates the impact of dyspnea on surgical patients and their loved ones, before, during, and post treatment^{24,15} cites dyspnea as a common symptom in the years following surgical resection. Additionally, the article reports that 65% of these patients offered no complaint of pre-operative dyspnea. In another longitudinal study exploring QOL in patients with resected ES-NSCLC two years postoperatively, surgery was found to have substantially reduced QOL across all domains except emotional functioning¹⁵. The impact of dyspnea on QOL is undeniable. Physically, this symptom is regarded as one of the most distressing, as the phenomenon of decreased oxygen leads to increased fatigue and breathlessness, and may be accompanied by discomfort, burning, numbness, or a feeling of impending death^{25,26}. It impacts ability to sleep, work, exercise, and experience intimacy²⁷. There are a multitude of psychological responses to dyspnea; that of fear, anxiety, and possibly guilt and depression, often exacerbating the dyspnea. From a social standpoint, patients suffer all manner of upset. There is observable role reversal, caregiver burden, loss of leisure activity, isolation, compromised sexuality, and frequently financial burden^{25,28}. Often overlooked is the spiritual suffering involved, along with existential questions when patients are faced with life altering symptoms such as lung cancer and dyspnea. Living often takes on new meaning and purpose, even when patients are diagnosed at an early stage. There appears to be an abundance of uncertainty, and loss of one's belief systems. It is imperative that the nurse's clinical assessment incorporate not only diagnostic manifestations, but provide a comprehensive examination into these all-encompassing QOL dimensions¹⁰.

Assessment of Dyspnea in Early Stage Lung Cancer

As dyspnea is a highly subjective symptom, evaluating an individual's shortness of breath is an obscure circumstance at best, and severity may be associated with the patient's perception of what the dyspnea means¹⁷. Along with assessing dyspnea quality, specific descriptions should be elicited according to the onset, duration, intensity, activity level, and psychological response before, during, and after dyspnea experience^{12,29,30}. Upon the initial assessment the nurse begins with the patients' subjective (self-report) of dyspnea, which can involve a quantitative scale (TABLE 2). Examples of scales available are the Numeric Rating Scale (where 0 = the least problem and 10 = the worst), or Visual Analog Scale which measures symptom intensity with a 100mm line (vertical or horizontal). Other commonly used measurements are Baseline Dyspnea Index (which grades severity of dyspnea in 3 different categories; functional status, magnitude of task, and magnitude of effort, 0 = severe, 4 = unimpaired), or Respiratory Distress Observational Scale, which is survey-like with observational documentation³⁰⁻³². Collectively, all scales ask the patient to rate dyspnea related to shortness of breath, impact on ADLs and/or QOL.

Objective assessment involves a thorough history and physical, providing invaluable information via the actual interview, assessment scales, auscultation and percussion, and is diagnostic in at least one half of patients. The use of imaging yields discovery of common cardiopulmonary diseases, along with those diagnostics listed below.

Nursing assessment of dyspnea may assist in locating the cause, in addition to establishing the most appropriate interventions regarding symptom prevention, management, and follow-

up. TABLE 2 presents an overview of nursing appraisal components. Along with the one-to-one assessment, imaging, a complete blood count, metabolic profile, arterial blood gases, ECHO/EKG, pulmonary function, and sputum cytology should be completed. Consideration should also be given to the possible side effects of, and outcomes, of the patient undergoing treatment intervention for their lung cancer, such as thoracic surgery, chemotherapy, or radiation.^{6,11,33}

Nursing Management of Dyspnea in Early Stage Lung Cancer

The goal of nursing in dyspnea is to obtain a full picture of the patient's experience and impact on ADLs and QOL for both the patient and family. Nurses must also acknowledge and accept the patient's self-report of dyspnea^{30,33}. Following a full assessment of all four domains in QOL (physical, psychological, social, spiritual), as seen in TABLE 2 it is of the utmost importance to achieve a thorough understanding of the perceptions, fears, and uncertainties surrounding the symptom of dyspnea. Nurses must be exceptionally skilled in assessing dyspnea in the ER-NSCLC patient, along with implementing effectual interventions, and improving outcomes for this population.

Once the medical and nursing assessment has taken place, the underlying cause is addressed. Depending on the chronicity of dyspnea the nurse is able to provide support for disease management including the interdisciplinary plan of care, promoting energy conservation, strict medication adherence, relaxation and coping techniques, nutritional evaluation, and pulmonary rehabilitation^{34,35}.

Working collaboratively, the nurse ensures the highest QOL possible for the patient and family, rendering education and referrals as needed. As an integral part of follow up the nurse should advocate for, chronic review of outcome and institute intervention refinement, endorse organizational and policy strategies, assess program needs concerning services to facilitate adequate surveillance, always embracing the patient's QOL^{36,37}.

Medical Management of Primary Disease Early Stage Lung Cancer

ES-NSCLC patients with dyspnea undergo all nature of complex treatment, including, but not limited to, surgery, radiotherapy, and chemotherapy, or a combination thereof. Even with current, cutting edge technologies long term survival remains somewhat elusive. After initial, potentially curative treatment, long term survival without recurrence remains elusive, as many patients develop new primary lung malignancies. In addition, 21% of ES-NSCLC patients enter into therapy with minimal or no dyspnea, yet any number of "curative" interventions may actually provoke dyspnea^{38,39}. After their potentially restorative treatment, ES-NSCLC patients with dyspnea require continued surveillance and follow-up care for dyspnea, other medical issues, and QOL concerns.

Clinical assessment and pretreatment evaluation for stage IA may consist of pulmonary function, cardiopulmonary exercise testing, bronchoscopy, mediastinoscopy and/or EBUS, and a PET/CT scan. For stage I–IIB, an MRI of the brain should also be performed^{1,5,6}.

For early stage disease, surgical resection is the standard of care, providing the best chance for cure. Surgical procedures range from limited resections of wedge or segmentectomy, to more extensive resections of a lobectomy, bilobectomy, or pneumonectomy. The surgical, if offered as an intervention, is largely dependent on histology, the extent of disease, and comorbidities such as cardiopulmonary status. Procedurally, surgery is performed with a posterolateral thoracotomy incision, or that of robotic or Video-assisted Thorascopic surgery (VATS). The lesser invasive procedures may reduce pain and recovery time, and perhaps lower morbidity.

For patients with wholly resected with stage I disease, adjuvant chemotherapy or radiotherapy is not recommended. For stage I–IIB disease chemotherapy and radiotherapy is most often instituted, according to histology, biomarkers, the tumor margins and location, and lymph node sampling ^{6,8,11}.

At times unique services may be available to the patient, such as pulmonary pre/rehabilitation. The definition of pulmonary rehabilitation is that it should be evidence-based, multidisciplinary, and comprehensive intervention for patients with acute and chronic respiratory disease who are symptomatic and often have decreased daily life activities ¹¹. It is designed to reduce symptoms, optimize function, increase participation, and reduce health care costs through stabilizing or reversing systemic manifestations of the disease ^{15,40,41}. Indications for referrals include dyspnea and co-morbid lung diseases such as COPD, asthma, and pulmonary fibrosis. Expectations would include a reduction in dyspnea, improved exercise capacity, sense of control regarding disease process, and overall enhanced QOL.

In considering the potential for interdisciplinary roles, it is best to consider who should be involved, the relevancy, what the interventions might consist of, and how quality of life outcomes are achieved. Most assuredly, thoracic surgeons or medical oncologists perform important functions, providing appropriate treatment regimens, according to the patient's medical requirements. Pulmonary rehabilitation should be enlisted early on, pre-treatment if possible. This would help to establish a baseline, enhance pulmonary function, and open the way for planning care during and post therapy ^{14,39,40}. Nutritional services should be provided to enhance the complex dietary needs of cancer patients. Lastly, clinical social work and/or chaplaincy are an indispensable supports for any individual with a malignant process. Social work can also coordinate psychological, financial, or legal resources. It is only through such a truly collaborative team that healing and progress can be achieved throughout the lung cancer trajectory ^{5,6,9,14}.

Medical surveillance should consist of a regular history and physical, along with a chest CT every 6–12 months for 2 years, then annually. The patient should receive an annual influenza and pneumococcal vaccination as appropriate, routine pulse oximetry, blood pressure, cholesterol, and glucose monitoring. Additional work up might consist of a bone density, routine dental examinations, and evaluation of diet and nutritional needs. Regular physical activity should be encouraged. ^{6,7}.

Case Presentation

Mr. B is a 67-year-old Asian American former athlete, with a former 50 pack-year history of smoking. He presented with abnormal imaging, with presumed stage IIB (ES-NSCLC). A PET/CT revealed uptake of a 5cm mass in the left upper lobe. There was also a small, slightly spiculated density in the left lower lobe, along with an enlarged mediastinal lymph node. The patient's comorbidities consisted of COPD, hypertension, and depression. Along with a complete history and physical, Mr. B underwent a pre-operative education by the nurse. Work up consisted of complete blood count and chemistry profile, pulmonary function, a brain MRI, bone scan, and an Echo/EKG. After it was noted that the brain MRI and bone scan were negative, discussions related to treatment alternatives were conducted at a chest conference. Upon dialogue with the thoracic surgeon, Mr. B opted to undergo VATS consisting of a pneumonectomy and mediastinal lymph node sampling. He was cleared for surgery and was later advised that the surgery went very well, and tumor margins were clear. His case was presented at the interdisciplinary thoracic tumor board, since his biomarkers were positive for excision repair cross-complementing group 1 (ERCC1) and ribonucleotide reductase M1 (RRM1), the patient decided on treatment defined by the NCCN for stage IIB

ES-NSCLC, per the physician's recommendation. This consisted of adjuvant chemotherapy of taxotere and gemcitabine, giving him the greatest chance for a curative effect. No radiation was intended. The plan of care was thoroughly discussed among the oncology team, the oncologist, and with the family present.

Prior to his initial treatment, Mr. B. was seen in pulmonary rehabilitation, nutrition, and had a PICC line placed for ease of obtaining blood specimens and chemotherapy administration. At his first chemotherapy appointment, with his spouse present, he met with the oncologist, and then the "chemo nurse." Teaching began with the patient and CG concerning the treatment schedule, side effects of the chemotherapy drugs, in concert with the routine ancillary medications needed to complete regimen. Information was also provided on whom, when, and where to call should issues arise. Symptom and medication diaries were provided. They were to be filled out and brought to clinic upon each return visit to evaluate for adverse events.

Mr. B did well postoperatively, and with his chemo treatment, yet suffered a great deal of dyspnea, due to the surgical intervention. He was compliant in the pulmonary rehabilitation program, yet continued to become more depressed over time at the loss of his athletic and social capacities. He also admitted to fear of intimacy, and not being able to "keep up" with his spouse. He was referred back to his local psychologist, who continues to work with Mr. B and his spouse on communication, role change, and intimacy concerns. At his last clinic visit, one year post treatment, his spirits were up, and he reported that his respiratory status had much improved. He cited his overall QOL as "good." It was determined that he was in remission, and would return for follow-up according to guidelines established by the NCCN (TABLE 2).

Implications for Dyspnea in Palliative Care

The intricacies of dyspnea are multifaceted and complex, and challenges facing health professionals remain rigorous and challenging. Nursing management and education of dyspnea in the ES-NSCLC patient is directed toward prevention, expedient recognition, all-inclusive assessment, genuine interdisciplinary methodology, and thorough follow-up surveillance. Nurses must be aware of the frequent and widespread etiologies of such cases, and institute chronic evaluation, coordination, and management of dyspnea, as these are all an integral components in the care of ES-NSCLC. Equipped with an understanding of patients and families equating shortness of breath with feelings of suffocation, helplessness, and isolation, the nurse is cognizant that all aspects of care must be attended to meticulously, from ADLs to the impact on QOL, and rehabilitative referrals.

There is a continued need for further clinical research in this arena. Although there are preliminary fundamental guidelines and personalized care in place, clinicians and nurse researchers must develop an empirical endeavor to better understand the experience of dyspnea in ES-NSCLC patients and their loved ones. With the increased numbers of cancer survivors healthcare must acknowledge the implications for establishing survivorship programs as an integral part of the cancer care trajectory ⁴².

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Table 1**Etiology of Dyspnea**

Known Cause	Possible Signs/Symptoms Accompanying Dyspnea	Intervention
Direct Cause		
Tumor Lymph invasion	Cough Difficulty Swallowing	Surgical Chemotherapy Radiation
Obstruction/restriction COPD Pulmonary embolism Asthma	Decreased O ₂ saturation Fremitus Clubbed fingers/toes Cyanosis Confusion	Controlled O ₂ Bronchodilators Corticosteroids Antibiotics Opioids Blood gases Sputum cytology Pulmonary Rehabilitation
Effusion	Diminished breath sounds	Thoracentesis Pleurex/pleurodesis Tunneled catheter
Indirect Cause		
Cancer Treatments Thoracic surgery Chemotherapy/biotherapy Radiation	Post op pain Loss of lung tissue CINV Cough	Treat underlying cause Pulmonary rehabilitation (See Table 3)
Anemia	Pallor	Transfusion Erythropoietin Nutritional consult
Cardiac pathology CHF MI Cardiomyopathy	Chest pain Congestion	EKG Echo Cardiac enzymes Diuretics and monitor fluid balance
Sepsis	Febrile Chills	Cytology Antibiotics
Pain	Patient reported Grimace	Treat underlying cause Pain medications as directed Distraction technique
Anxiety Panic	Tachypnea Tachycardia Diaphoresis	Anxiolytics Teach coping techniques Psychology/CSW referral Remain with pt during exacerbation
Sedentary lifestyle	Activity intolerance	Exercise program Nutritional consult

Adapted from References 3, 10, 11, 13, 15, 16, 20, 32.

Table 2**Assessment of Dyspnea in ES-NSCLC Patients**

Subjective	Objective
<i>Self-reporting Scales such as:</i> <ul style="list-style-type: none"> Numeric Rating Scale <ul style="list-style-type: none"> 0 = no problem, 10 = the worst Baseline Dyspnea Scale <ul style="list-style-type: none"> Functional Magnitude of task Magnitude of effort Respiratory Distress Observational Scale <ul style="list-style-type: none"> Observational documentation 	<i>History and Physical:</i> <ul style="list-style-type: none"> Vital signs Systems review Respiratory Assessment <ul style="list-style-type: none"> Auscultation/Percussion Quality of breaths (pursed lip, puffing, blowing, flared nostrils) Dry or productive cough Sputum quantity and character Use of accessory muscles Ability to complete full sentence Identify stable or unstable dyspnea and acute respiratory failure Skin color and temperature Dependent edema and abdominal girth Smoking and COPD screening
<i>Symptomology and interference with ADLs:</i> <ul style="list-style-type: none"> Baseline, during treatment and exacerbations Onset (sudden or gradual), intensity, duration What alleviates or aggravates dyspnea 	<i>Pulmonary Function Testing:</i> <ul style="list-style-type: none"> Pulse oximetry Spirometry
<i>Impact of Symptoms on QOL:</i> <ul style="list-style-type: none"> Physical - difficulty breathing, decreased O₂, compromised activity, fatigue Psychological - fear, depression, anxiety Social - financial burden, isolation Spiritual - meaning and purpose in life, which <i>is</i> breathing 	<i>Laboratory Testing:</i> <ul style="list-style-type: none"> Complete blood count (anemia) Chemistry ABGs (blood gases)
<i>Assess:</i> <ul style="list-style-type: none"> Inhaler/O₂ techniques Medication administration and compliance Strategy for secretion clearance Shuttle walking test 	<i>Imaging:</i> <ul style="list-style-type: none"> Chest x-ray CT Echo
<i>Education/Evaluation as needed: (Maintain Sx Diary)</i> <ul style="list-style-type: none"> Alter perception of breathlessness <ul style="list-style-type: none"> Sit upright supported by pillow Provide ambient air flow in environment (fan) Reduce respiratory demand <ul style="list-style-type: none"> Plan important activities first (energy conservation) Teach pursed lip/diaphragmatic breathing 	<i>Consultations and Surveillance:</i> <ul style="list-style-type: none"> Nutrition (healthy diet and maintenance) Pulmonary rehabilitation CT every 6–12 months, then annually Annual influenza and pneumococcal vaccinations Routine VS, pulse oximetry, and lab work

Subjective	Objective
<ul style="list-style-type: none">- Rest periods/relaxation and coping techniques- Keep frequently used items within reach- Walker or wheelchair as needed- Perform grooming sitting down- Wear clothing that is easy to put on- Avoid environmental irritants- Call MD/NP if<ul style="list-style-type: none">◆ Febrile > 100.5◆ Change in breathing, cough or sputum	<ul style="list-style-type: none">• Bone density as appropriate• Routine dental exams• Regular physical activity

Adapted from references 3, 10, 11, 13, 15, 17, 18, 23, 31, 32.

Table 3**Methods of Pulmonary Rehabilitation****Prevention**

- 1 Smoking cessation
- 2 Assure immunizations
- 3 Prevent exacerbation
- 4 Optimize medical management

Self-management

- 1 Medication training:
 - a. Metered dose inhaler
 - b. Nebulizer
- 2 Bronchial hygiene
- 3 Breathing retraining
- 4 Oxygen therapy
- 5 Adequate nutrition
- 6 Family training
- 7 Reporting to physician
- 8 Exacerbation protocol
 - a. Self-assessment
 - b. Self-intervention
 - c. Access physician

Dyspnea relief

- 1 Exercise program
- 2 Breathing retraining
- 3 Bronchodilators
- 4 Bronchial hygiene
- 5 Reduce anxiety, depression
- 6 Reduce fear, apprehension
- 7 Improve confidence

Gas Exchange/Oxygen Transport

- 1 Oxygen therapy
- 2 Bronchial hygiene
- 3 Exercise program

Exercise training

- 1 Ambulation training
- 2 Upper extremity training
- 3 Ventilatory Muscle Training

Functional training (ADL)

- 1 Self-care
- 2 Care of the home

- 3 Leisure pursuits
- 4 Work (as appropriate)
- 5 Active lifestyle
- 6 Shopping
- 7 Sexual counseling

Team support

- 1 Acceptance of disease
- 2 Coping skills
- 3 Encouragement
- 4 Positive thinking
- 5 Self-esteem
- 6 Quality of life focus

Advance directives

- 1 Advance directives
- 2 Continuing directives

Adapted from Tiep BL. Disease management of COPD with pulmonary rehabilitation. *Chest*. Dec 1997;112(6):1630–1656, Table 2.