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Chronic Obstructive Pulmonary Disease:

Clinical implications for patients with lung cancer

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Abstract

BACKGROUND—Chronic obstructive pulmonary disease (COPD) is the most common smoking-related illness. COPD often is underemphasized as a comorbidity except when considering issues surrounding surgical treatment options.

OBJECTIVES—This article aims to provide nurses with an overview of the pharmacologic and nonpharmacologic treatment implications of COPD.

METHODS—Definitions, differentials, and treatment considerations are provided, and clinical implications and resources are described.

FINDINGS—The added burden of dyspnea, fatigue, and psychological distress related to COPD may affect the overall outcome and quality of life (QOL) of patients with lung cancer. Attention to the prevention, assessment, and treatment of lung cancer and COPD and related symptomatology will help maximize patients' QOL.

Keywords

Chronic obstructive pulmonary disease; immunotherapy; lung cancer; quality of life

THE DIAGNOSIS OF LUNG CANCER IS A PATIENT'S FIRST STEP in a long course of testing and treatment that may be complicated by additional factors, such as comorbidities. Comorbidities are simultaneous or sequential illnesses and disorders in the same person. These illnesses also may interact with each other, affecting the course and outcome of each (Valderas, Starfield, Sibbald, Salisbury, & Roland, 2009). Considering comorbidities is critical when initiating and modifying a patient's lung cancer treatment options. For example, because a patient's advanced age and lower functional status

significantly affect lung cancer treatment tolerance, clinicians may tailor treatment plans to take these variables into account (Hsu et al., 2015; Valderas et al., 2009). Chronic obstructive pulmonary disease (COPD) is an often-underemphasized, but prevalent and significant, comorbidity in patients with lung cancer. Before the mid-1980s, clinicians observed that a higher proportion of patients with COPD had lung cancer, but whether it contributed to lung cancer along with smoking, or if smoking was an independent risk factor for the development of both diseases, was unclear (Skillrud, Offord, & Miller, 1986). The relationship between COPD and lung cancer was considered in a seminal study by Skillrud et al. (1986), who examined 226 patients, half with COPD and half without COPD, during a 10-year period. Their trial, confirmed by Young et al. (2009), demonstrated that COPD was an independent risk factor for the development of lung cancer when controlling for age, sex, smoking, and occupation.

Dyspnea, functional decline, and pulmonary cachexia (unintentional and irreversible weight loss)—all associated with COPD—can heavily affect a patient's outcome, independent of the effects of lung cancer disease and treatment (Lehto, 2016; Schols, 2002). With a reported prevalence of 40%–70% in patients with lung cancer (Loganathan, Stover, Shi, & Venkatraman, 2006; Soubeyran et al., 2012; Young et al., 2009), COPD is a common comorbidity that oncology clinicians should carefully consider when developing lung cancer treatment plans. The purpose of this article is to present the definition, differentials, diagnosis, and treatment of COPD, and to offer treatment considerations for patients with lung cancer who have COPD as a comorbid condition. The authors conclude with practice implications and resources for clinicians (namely, oncology nurses and advanced practice nurses) in relation to the most common symptoms of COPD: dyspnea, fatigue, and psychological distress.

The Global Initiative for Chronic Obstructive Lung Disease ([GOLD], 2016) defines COPD as “persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles and gases” (p. 2). Cigarette smoking is the most important single risk factor for the development of COPD. However, many people with COPD are not cigarette smokers, and large proportions of them are younger people, women, or residents of developing countries. Key risk factors for COPD include genetic syndromes, such as α 1-antitrypsin deficiency, and occupational exposures. Additional factors include outdoor air pollution, secondhand smoke, smoke from burning fuels, and dietary factors; however, the evidence is not sufficient to infer a causal relationship for any of these factors (Eisner et al., 2010).

Diagnosis and Differential

Healthcare professionals often suspect COPD based on a patient's clinical presentation, which may include a prolonged history of dyspnea, sputum production, exercise intolerance, coughing, or wheezing. Diagnosis is confirmed by measures of airflow limitation, which is determined by the spirometry portion of a pulmonary function test (see Table 1) and includes forced expiratory volume (FEV1, the amount of air forcefully exhaled in one second) and forced vital capacity (FVC, the total amount of air exhaled). COPD traditionally is diagnosed when the post-bronchodilator FEV1/FVC fixed ratio is less than 0.7. Although

controversy surrounds this topic, the American Thoracic Society and European Respiratory Association define obstruction as the fifth-percentile lower limit of normal of the FEV1/FVC ratio, rather than the fixed ratio, because the fixed ratio decreases with age (van Dijk et al., 2015). Severity staging is based on the GOLD (2016) classification system and considers airflow limitation measures, symptoms, breathlessness, and hospital admissions.

Some symptomatic patients with a smoking history do not have obstruction during pulmonary function testing and do not meet the criteria for COPD but are found to have emphysema on a computed tomography scan. Emphysema is the physical distention and destruction of the lung alveoli and is treated very similarly to COPD. However, patients with emphysema tend to have lower body mass index and require more oxygen, and patients with COPD more consistently complain of dyspnea, cough, and increased sputum production (Renvall, Friedman, & Ramsdel, 2009).

Asthma, bronchiolitis obliterans, bronchiectasis, and congestive heart failure also can mimic and overlap COPD; failure to rule out these illnesses can harm a patient. For example, misdiagnosis of asthma in a patient with COPD could lead to inappropriate use of inhaled corticosteroids, thereby increasing a patient's risk of severe pneumonia. Conversely, the misdiagnosis of COPD in patients with asthma could result in the underuse of inhaled corticosteroids, thereby increasing potential for asthma exacerbations (Price, Yawn, & Jones, 2010).

Treatments

COPD treatment focuses on nonpharmacologic and pharmacologic therapies, as well as potential modifications to lung cancer therapy (Jantarakupt & Porock, 2005). Nurses have unique roles as interprofessional team members who can direct attention to curative and palliative therapies.

Nonpharmacologic Options

SMOKING CESSATION—Smoking cessation interventions have the greatest capacity to influence the natural history of COPD. Relapse is common and reflects the nature of tobacco dependence and addiction, not clinician or patient failure. Counseling by healthcare professionals significantly increases quit rates as opposed to self-initiated strategies. A strong dose-response relationship exists between counseling intensity and smoking cessation success (Eisner et al., 2010); however, even brief (three-minute) counseling results in smoking cessation rates of 5%–10% (Fiore et al., 2008). Psychological dependence is a powerful issue for most patients, and stress is a common reason cited for smoking resumption. Stress alleviation interventions, including programs involving family members, friends, and support groups, help optimize smoking cessation success. A wide range of cessation strategies is available (see Figure 1).

SUPPORT GROUPS—Support groups are another means of motivating patients to better manage their chronic lung disease (see Figure 2). The American Lung Association ([ALA], 2018) supports Better Breathers Club®, which consists of local, in-person support groups for patients with chronic lung diseases and their family members. Online resources offer

educational and emotional support for homebound and rural patients. Some of these resources allow web-based interactivity between lung cancer specialists and patients and their family members (Schook et al., 2013). The Lung Cancer Alliance created the Phone Buddy Program, which connects survivors and patients with lung cancer for information and emotional support purposes. Innovative mobile applications help patients monitor their symptoms and even have facilitated early identification of tumor recurrence, significantly improving chances of survival (Denis et al., 2016).

BREATHING AND POSITIONING TECHNIQUES—The American Thoracic Society and European Respiratory Association recommend positioning techniques (e.g., upright postures, use of rollator walkers) for patients with COPD (Solway, Brooks, Lau, & Goldstein, 2002; Spruit et al., 2013) and breathing exercises for patients unable to access or complete pulmonary rehabilitation (Holland, Hill, Jones, & McDonald, 2012). Although these positions have not been demonstrated to enhance exercise performance, many patients with chronic lung disease use these techniques instinctively and report decreased dyspnea. Assistive devices like rollator walkers allow forward leaning with arm support while ambulating and have been shown to decrease dyspnea and increase exercise capacity (Probst et al., 2004; Spruit et al., 2013).

A Cochrane review of breathing exercises for patients with COPD, including pursed lip breathing, diaphragmatic breathing, and other techniques, concluded that breathing training positively affects exercise capacity and has a mixed-results effect on dyspnea (Holland et al., 2012). Pursed lip breathing attempts to prolong active expiration through half-opened lips and has been found to ease COPD-related dyspnea and provide other breathing-related benefits, at rest (Bianchi et al., 2004; Nield, Soo Hoo, Roper, & Santiago, 2007). Some evidence exists that pursed lip breathing also can improve exercise capacity and the recovery respiratory rate during exercise (Bhatt et al., 2013).

Diaphragmatic breathing techniques decrease the energy load of breathing and improve the distribution of ventilation (Vitacca, Clini, Bianchi, & Ambrosino, 1998); however, the evidence is mixed on whether diaphragmatic breathing affects dyspnea. These mixed results could be because of inconsistently applied instruction and insufficient training to ensure that a patient performs diaphragmatic breathing correctly (Calhalin, Braga, Matsuo, & Hernandez, 2002; Holland et al., 2012). Diaphragmatic breathing should be discontinued if patients experience increased dyspnea and fatigue during it. Suggestions for optimizing diaphragmatic breathing training success include upright positioning (forward leaning if severe COPD), sensory stimulation (tactile, auditory, and visual), and evaluation of patient competency during performance (Calhalin et al., 2002).

PULMONARY REHABILITATION—Pulmonary rehabilitation provides supervised, progressive exercise rehabilitation for patients with COPD. A typical program focuses on breathing exercises, exercise reconditioning, progressive relaxation techniques, and smoking cessation, along with education about the disease process and related equipment, a nutritional evaluation, and social support (Mathai, 2016). Longer (more than 12 weeks) programs are more beneficial than shorter ones, with an eight-week minimum being required for a substantial effect on exercise performance and quality of life (QOL) (Spruit et al.,

2013). Typically, a home-based component follows the main pulmonary rehabilitation program. Continued exercise has been shown to prevent reversion to baseline dyspnea one year postprogram (du Moulin, Taube, Wegscheider, Behnke, & van den Bussche, 2009).

COMPLEMENTARY THERAPIES—In 2009, the Society for Integrative Oncology issued clinical practice guidelines recommending mind-body modalities, including mindfulness-based stress reduction and yoga, for patients with cancer (Shennan, Payne, & Fenlon, 2011). The American College of Chest Physicians later recommended that symptomatic individuals with lung cancer use mind-body modalities to reduce acute pain, chronic pain, anxiety, mood disturbance, and sleep disturbances, and to improve QOL; they also should consider using movement-based mind-body modalities (e.g., yoga) to reduce fatigue and sleep disturbances while improving mood and QOL (Deng et al., 2013).

Pharmacologic Options

INHALED MEDICATIONS—Inhaled medications are of primary importance in managing COPD symptoms. These medications include rescue and controller medications and come in mist or powder form. The benefits of using inhalers correctly cannot be overstated. In a study by Sulku et al. (2016), half of patients with COPD demonstrated incorrect inhaler technique, including an inability to load the inhaler or hold it correctly. Patients with less education are significantly more likely to demonstrate incorrect inhaler technique, most likely related to lower health literacy (Melzer et al., 2017). When offering medication information, nurses can include print materials designed at a basic reading level. In-person inhaler training provides real-time feedback on the correct technique. This reinforcement is particularly important for older adults, because they are more likely to benefit from tailored education that includes technique coaching (Crane, Jenkins, Goeman, & Douglass, 2014). Technology-based interventions, such as videos and electronic devices that connect directly to the inhaler, also may be helpful (Carpenter, Roberts, Sage, George, & Horne, 2017).

β_2 adrenergic agonists are classified as either short-acting (SABAs, with a 3- to 6-hour effect) or long-acting (LABAs, with a 12- to 24-plus-hour effect). SABAs and LABAs relax smooth muscles, resulting in bronchial dilation and increased mucociliary clearance (Ohar & Donohue, 2010). For asymptomatic or minimally symptomatic patients, a SABA used as needed is appropriate. When COPD symptoms cannot be controlled with a SABA alone, GOLD (2016) guidelines recommend a LABA or long-acting inhaled muscarinic antagonist (LAMA), also known as an anticholinergic. Inhaled LAMAs achieve bronchodilation and decreased mucus production by inhibiting airway cholinergic tone. LAMAs are not for rescue use because their effect is delayed; however, because of their prolonged duration of action (24-plus hours), LAMAs are more effective than LABAs in preventing exacerbations (Vogelmeier et al., 2011). LABAs and LAMAs can be prescribed separately or, for symptomatic patients, in combination (for a synergistic bronchodilator effect).

Inhaled corticosteroids, used alone or with LABAs, are controversial in COPD management. Earlier studies showed no significant survival benefit for patients with COPD using inhaled corticosteroids alone, while demonstrating an increased risk for adverse effects (e.g., severe pneumonia). In addition, patients using inhaled corticosteroids and LABAs had no greater

bronchodilation than those using only LABAs (Ernst, Gonzalez, Brassard, & Suissa, 2007). Although inhaled corticosteroids can be added later to help with uncontrolled symptoms, evidence suggests that inhaled corticosteroids may be most appropriate for patients with COPD who have concurrent asthma or documented sputum eosinophilia (Ernst, Saad, & Suissa, 2015).

OTHER MEDICATIONS—Theophylline, a methylxanthine drug with weak bronchodilating effects, historically was used in patients with COPD to relax bronchial smooth muscle. Theophylline rarely is used currently because of its potential interaction with other medications and numerous side effects. Theophylline typically is used as salvage therapy when other treatments are ineffective and other traditional medical options have been exhausted (Barnes, 2003).

The newest class of drugs used in patients with COPD is roflumilasts, selective long-acting phosphodiesterase-4 inhibitors indicated to reduce exacerbations in patients with chronic bronchitis. Primary side effects include weight loss and diarrhea on initiation (Calverley, Martinez, Fabbri, Goehring, & Rabe, 2012). Although roflumilasts have been shown to ease dyspnea symptoms, improve QOL, and decrease exacerbations, none have been shown to increase survival rates (Karner, Chong, & Poole, 2012; Welte, 2009). Increasing costs, plus changes in Medicare benefits, have made these medicines increasingly unaffordable.

OXYGEN THERAPY—Oxygen therapy is recommended for patients with COPD who have documented hypoxemia (abnormally low oxygen in the blood), which often is confused with breathlessness (the sensation of not being able to breathe) (Welte, 2009). A patient must meet one of three specified criteria to qualify for insurance coverage for oxygen therapy. Although it does not improve lung function, oxygen therapy is associated with improved survivability in patients with COPD who have hypoxemia and may improve dyspnea in patients with minimal to no hypoxemia (Uronis et al., 2015). Evidence suggests that continuous supplemental oxygen improves exercise capacity in patients with mild to moderate COPD (Stoller, Panos, Krachman, Doherty, & Make, 2010). However, an evaluation of 738 patients with COPD who did not desaturate at rest or drop below 80% during a walk test showed no difference in survival rates, COPD exacerbations, QOL, walk distance, or lung function in patients given supplemental oxygen versus those not given it (Long-Term Oxygen Treatment Trial Research Group, 2016).

VACCINES—Influenza and pneumococcal vaccines are important to the care of patients with chronic lung disease. Updated Centers for Disease Control and Prevention ([CDC], 2017) guidelines recommend that patients with chronic lung disease who are considered high-risk and aged 19–65 years receive one dose of the pneumococcal polysaccharide vaccine (PPSV23); patients aged 65 years or older should receive the newer vaccine (PPSV13), followed by a second (final) dose of PPSV23 one year later.

Treatment Considerations and Modifications

A treatment plan that includes surgery, radiation therapy, and chemotherapy, or a combination thereof, for a patient with lung cancer and COPD is best made by a

multidisciplinary team. A patient may have excellent physical function but compromised social support, a psychiatric disorder, or inadequate resources. These factors may limit a patient's viable treatment options. Referrals to support groups, educational programs, and smoking cessation or stress management interventions play a critical role in caring for patients with lung cancer and COPD. Telemedicine interventions have demonstrated potential for successfully integrating care, particularly when patient management must be done from a distance (Hernandez, Mallow, & Narsavage, 2014).

Lung Resection and Radiation

The trend toward referring patients with more severe COPD for resection began after several published studies found that patients who underwent lobectomies had either minimal loss of FEV1 or stability (Carretta et al., 1999). One study (Korst et al., 1998) found that patients with the lowest FEV1 values experienced improvement in these values postoperatively. Since then, the association between patients with COPD and early-stage lung cancer, and lower overall and progression-free survival after complete resection, has been confirmed in a retrospective review of 442 patients with stage IA lung cancer (Sekine et al., 2007). In this review, pneumonia and tracheostomy tube placement rates were higher in patients with COPD (Sekine et al., 2007).

These data raise the question of whether patients with COPD should be offered resection if their mortality rate and postoperative complication risk are higher. Pompili, Brunelli, Refai, Xiume, and Sabbatini (2010) studied 50 patients with COPD and 50 without who underwent lobectomy for early-stage lung cancer; they did not detect a difference in QOL scores or pre- and postoperative QOL between groups. Several studies have examined QOL after stereotactic body radiation therapy (SBRT), or stereotactic ablative radiation therapy (SABR) (Crabtree et al., 2010; Lagerwaard et al., 2012; Onishi et al., 2011). A prospective study of 382 patients who underwent SBRT/SABR in the Netherlands showed no clinical or statistical differences pre- and post-treatment (Lagerwaard et al., 2012). Although QOL is important, the best option adequately balances QOL and survival concerns. Two studies comparing SBRT/SABR and surgical resection treatments showed comparable survival rates (Palma, Lagerwaard, Rodrigues, Haasbeek, & Senan, 2012; Zheng et al., 2014). Therefore, SBRT/SABR is a viable option for patients unable to undergo surgical resection.

Chemotherapy and Immunotherapy

Although most patients traditionally have received platinum-based therapies for stage III or IV non-small cell lung cancer (NSCLC), interest is growing in immunotherapy, specifically checkpoint inhibitors. These drugs have minimal side effects and are being studied as rescue therapy, firstline therapy, and supplements to traditional chemotherapy (Rafei, El-Bahesh, Finianos, Nassereddine, & Tabbara, 2017). One such inhibitor, pembrolizumab, was compared to chemotherapy in a group of patients with advanced NSCLC. Pembrolizumab yielded significantly longer progression-free and overall survival with fewer side effects compared to platinum-based chemotherapy (Reck et al., 2016). Results are promising for patients with significant comorbidities and limited tolerance of therapy.

Pulmonary Rehabilitation

Much research has gone into determining if patients undergoing lung cancer resection would benefit from pulmonary rehabilitation pre- or postoperatively. Patients with COPD who undergo pulmonary rehabilitation have increased six-minute walk distances and reduced COPD exacerbations (Ries et al., 2007; van Ranst, Stoop, Meijer, Otten, & van de Port, 2014). Several small studies demonstrated that patients with inoperable lung cancer, who underwent an exercise intervention, improved their six-minute walk and muscle strength measurements (Quist et al., 2012) or had increased FEV1 and FVC after completion of a 10-week pulmonary rehabilitation program (Tarumi et al., 2015). Other small studies show improved QOL after pulmonary rehabilitation (Janssen, Abbink, Lindeboom, & Vliet Vlieland, 2017; Sommer et al., 2016).

Many patients are eager to proceed with resection as soon as possible, but evidence suggests they should consider pulmonary rehabilitation first. Bradley et al. (2013) compared 58 patients who underwent pre- and postoperative pulmonary rehabilitation with 305 patients who underwent usual care (omitting pulmonary rehabilitation). In their results, the intervention group had increased FEV1 and six-minute walk distances preoperatively, and 54% stopped smoking; they also exhibited fewer postoperative hospital complications and readmissions. Overall, data clearly support using pulmonary rehabilitation as an adjuvant therapy in patients with COPD who have lung cancer, both pre- and postoperatively.

Ongoing Evaluation

Some therapies cause secondary issues (e.g., radiation pneumonitis, bronchospasm, worsening of nutritional status) that can be life-threatening when compounded with chronic lung disease. Pulmonary function and clinical status should continually be evaluated, particularly after therapies are completed.

Clinical Management Implications and Resources

The twofold burden of COPD alongside lung cancer can affect dyspnea, fatigue, and psychological distress, three of these patients' most common and troubling symptoms (Lehto, 2016). If these factors are anticipated and addressed adequately, the QOL of these patients and their families can be enhanced. Patient and family member input can be invaluable for understanding individual QOL concerns. Assessing QOL during clinical practice is an important trend (Varricchio & Ferrans, 2010) but should be simple, efficient, and easy to score and interpret.

A detailed discussion of symptom management is beyond the current article's scope. Several lung cancer-specific QOL instruments include symptom assessment (McDonnell et al., 2014), and some organizations also have published guidelines for symptom management in patients with COPD and lung cancer (see Figure 3).

Conclusion

Optimal treatment of concurrent COPD is crucial to the success of lung cancer therapy. Oncology and advanced practice nurses can play an essential role in these patients' care,

which requires early and close attention to prevention, assessment, treatment, and surveillance of both diseases and related symptomatology. Patients with lung cancer and COPD benefit from a multidisciplinary disease management approach throughout their illnesses to ensure maximum QOL and functional status (for themselves and their families). In collaboration with a pulmonologist, oncology and advanced practice nurses can help improve these patients' health outcomes using pharmacologic and nonpharmacologic treatments and symptom management (Shinde & Dashti, 2016; Williams, Grant, Tiep, Kim, & Hayter, 2012). More clinical research is needed to expand understanding of the management of patients with this twofold disease burden, to increase the use of existing evidence-based interventions, and to develop and test new QOL-boosting interventions.

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REFERENCES

- American Lung Association. (2018). Better Breathers Club. Retrieved from <http://www.lung.org/support-and-community/better-breathers-club>
- Barnes PJ (2003). Theophylline: New perspectives for an old drug. *American Journal of Respiratory and Critical Care Medicine*, 167, 813–818. 10.1164/rccm.200210-1142PP [PubMed: 12623857]
- Bhatt SP, Luqman-Arafath TK, Gupta AK, Mohan A, Stoltzfus JC, Dey T, . . . Guleria R (2013). Volitional pursed lips breathing in patients with stable chronic obstructive pulmonary disease improves exercise capacity. *Chronic Respiratory Disease*, 10, 5–10. 10.1177/1479972312464244 [PubMed: 23149383]
- Bianchi R, Gigliotti F, Romagnoli I, Lanini B, Castellani C, Grazzini M, & Scano G (2004). Chest wall kinematics and breathlessness during pursed-lip breathing in patients with COPD. *Chest*, 125, 459–465. [PubMed: 14769725]
- Bradley A, Marshall A, Stonehewer L, Reaper L, Parker K, Bevan-Smith E, . . . Naidu B (2013). Pulmonary rehabilitation programme for patients undergoing curative lung cancer surgery. *European Journal of Cardio-Thoracic Surgery* 44, e266–e271. 10.1093/ejcts/ezt381 [PubMed: 23959742]
- Calhalin LP, Braga M, Matsuo Y, & Hernandez ED (2002). Efficacy of diaphragmatic breathing in persons with chronic obstructive pulmonary disease: A review of the literature. *Journal of Cardiopulmonary Rehabilitation*, 22, 7–21. [PubMed: 11839992]
- Calverley PM, Martinez FJ, Fabbri LM, Goehring UM, & Rabe KF (2012). Does roflumilast decrease exacerbations in severe COPD patients not controlled by inhaled combination therapy? The REACT study protocol. *International Journal of Chronic Obstructive Pulmonary Disease*, 7, 375–382. 10.2147/COPD.S31100 [PubMed: 22791991]
- Carpenter DM, Roberts CA, Sage AJ, George J, & Horne R (2017). A review of electronic devices to assess inhaler technique. *Current Allergy and Asthma Reports*, 17(3), 17 10.1007/s11882-017-0684-3 [PubMed: 28290015]
- Carretta A, Zannini P, Puglisi A, Chiesa G, Vanzulli A, Bianchi A, . . . Bianco S (1999). Improvement of pulmonary function after lobectomy for non-small cell lung cancer in emphysematous patients. *European Journal of Cardio-Thoracic Surgery*, 15, 602–607. [PubMed: 10386404]
- Centers for Disease Control and Prevention. (2017). Pneumococcal vaccination: Information for healthcare professionals. Retrieved from <http://www.cdc.gov/vaccines/vpd-vac/pneumo/vac-PCV13-adults.htm#recommendations>
- Crabtree TD, Denlinger CE, Meyers BF, El Naqa I, Zoole J, Krupnick AS, . . . Bradley JD (2010). Stereotactic body radiation therapy versus surgical resection for stage I non-small cell lung cancer.

- Journal of Thoracic and Cardiovascular Surgery 140, 377–386. 10.1016/j.jtcvs.2009.12.054 [PubMed: 20400121]
- Crane MA, Jenkins CR, Goeman DP, & Douglass JA (2014). Inhaler device technique can be improved in older adults through tailored education: Findings from a randomised controlled trial. *NPJ Primary Care Respiratory Medicine*, 24, 14034 10.1038/npjpcrm.2014.34
- Deng GE, Rausch SM, Jones LW, Gulati A, Kumar NB, Greenlee H, . . . Cassileth BR (2013). Complementary therapies and integrative medicine in lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest*, 143(Suppl. 5), e420S–e436S. 10.1378/chest.12-2364 [PubMed: 23649450]
- Denis F, Lethrosne C, Pourel N, Molinier O, Pointreau Y, Domont J, . . . Letellier C (2016). Overall survival in patients with lung cancer using a web-application-guided follow-up compare to standard modalities: Results of phase III randomized trial [Abstract LBA9006]. *Journal of Clinical Oncology* 34 Retrieved from <https://meetinglibrary.asco.org/record/123460/abstract>
- du Moulin M, Taube K, Wegscheider K, Behnke M, & van den Bussche H (2009). Home-based exercise training as maintenance after outpatient pulmonary rehabilitation. *Respiration*, 77 139–145. 10.1159/000150315 [PubMed: 18667807]
- Eisner MD, Anthonisen N, Coultas D, Kuenzli N, Perez-Padilla R, Postma D, . . . Balmes JR (2010). An official American Thoracic Society public policy statement: Novel risk factors and the global burden of chronic obstructive pulmonary disease. *American Journal of Respiratory and Critical Care Medicine*, 182, 693–718. 10.1164/rccm.200811-1757ST [PubMed: 20802169]
- Ernst P, Gonzalez AV, Brassard P, & Suissa S (2007). Inhaled corticosteroid use in chronic obstructive pulmonary disease and the risk of hospitalization for pneumonia. *American Journal of Respiratory and Critical Care Medicine*, 176, 162–166. 10.1164/rccm.200611-1630OC [PubMed: 17400730]
- Ernst P, Saad N, & Suissa S (2015). Inhaled corticosteroids in COPD: The clinical evidence. *European Respiratory Journal*, 45, 525–537. 10.1183/09031936.00128914 [PubMed: 25537556]
- Fiore MC, Jaén CR, Baker TB, Bailey WC, Benowitz NL, Curry SJ, . . . Wewers ME (2008). Treating tobacco use and dependence: 2008 update. Rockville, MD: U.S. Department of Health and Human Services.
- Global Initiative for Chronic Obstructive Lung Disease. (2016). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Retrieved from <http://goldcopd.org/download/120>
- Hernandez C, Mallow J, & Narsavage GL (2014). Delivering telemedicine interventions in chronic respiratory disease. *Breathe*, 10, 198–212. 10.1183/20734735.008314 [PubMed: 26843894]
- Holland AE, Hill CJ, Jones AY, & McDonald CF (2012). Breathing exercises for chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews*, 10, CD008250 10.1002/14651858.CD008250.pub2 [PubMed: 23076942]
- Hsu CL, Chen JH, Chen KY, Shih JY, Yang JC, Yu CJ, & Yang PC. (2015). Advanced non-small cell lung cancer in the elderly: The impact of age and comorbidities on treatment modalities and patient prognosis. *Journal of Geriatric Oncology*, 6, 38–45. 10.1016/j.jgo.2014.09.178 [PubMed: 25245172]
- Janssen SM, Abbink JJ, Lindeboom R, & Vliet Vlieland TP (2017). Outcomes of pulmonary rehabilitation after treatment for non-small cell lung cancer stages I and IIIa: An observational study. *Journal of Cardiopulmonary Rehabilitation and Prevention*, 37, 65–71. 10.1097/HCR.0000000000000227 [PubMed: 28005681]
- Jantarakupt P, & Porock D (2005). Dyspnea management in lung cancer: Applying the evidence from chronic obstructive pulmonary disease. *Oncology Nursing Forum*, 32, 785–797. 10.1188/05.ONF.785-797 [PubMed: 15990908]
- Karner C, Chong J, & Poole P (2012). Tiotropium versus placebo for chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews*, 7, CD009285 10.1002/14651858.CD009285.pub2
- Korst RJ, Ginsberg RJ, Ailawadi M, Bains MS, Downey RJ Jr., Rusch VW, & Stover D (1998). Lobectomy improves ventilatory function in selected patients with severe COPD. *Annals of Thoracic Surgery*, 66, 898–902. 10.1016/S0003-4975(98)00697-3 [PubMed: 9768948]

- Lagerwaard FJ, Aaronson NK, Gundy CM, Haasbeek CJ, Slotman BJ, & Senan S (2012). Patient-reported quality of life after stereotactic ablative radiotherapy for early-stage lung cancer. *Journal of Thoracic Oncology*, 7, 1148–1154. 10.1097/JTO.0b013e318252cfefLoganathan, [PubMed: 22610256]
- Lehto RH (2016). Symptom burden in lung cancer: Management updates. *Lung Cancer Management*, 5, 61–78. 10.2217/lmt-2016-0001 [PubMed: 30643551]
- Loganathan RS, Stover DE, Shi W, & Venkatraman E (2006). Prevalence of COPD in women compared to men around the time of diagnosis of primary lung cancer. *Chest*, 129, 1305–1312. 10.1378/chest.129.51305 [PubMed: 16685023]
- Long-Term Oxygen Treatment Trial Research Group. (2016). A randomized trial of long-term oxygen for COPD with moderate desaturation. *New England Journal of Medicine*, 375, 1617–1627. 10.1056/NEJMoa1604344 [PubMed: 27783918]
- Mathai SC (Ed.). (2016). 2016 lung disorders white paper. New York, NY: Remedy Health Media.
- McDonnell KK, Bullock LF, Kozower BD, Hollen PJ, Heath J, & Rovnyak V (2014). A decision aid to improve smoking abstinence for families facing cancer. *Oncology Nursing Forum*, 41, 649–658. 10.1188/14.ONF.649-658 [PubMed: 25355020]
- Melzer AC, Ghassemieh BJ, Gillespie SE, Lindenauer PK, McBurnie MA, Mularski RA, . . . Au DH (2017). Patient characteristics associated with poor inhaler technique among a cohort of patients with COPD. *Respiratory Medicine*, 123, 124–130. <https://doi.org/10.1016/j.rmed.2016.12.011> [PubMed: 28137488]
- Nield MA, Soo Hoo GW, Roper JM, & Santiago S (2007). Efficacy of pursed-lips breathing: A breathing pattern retraining strategy for dyspnea reduction. *Journal of Cardiopulmonary Rehabilitation and Prevention*, 27, 237–244. 10.1097/01.HCR.0000281770.82652.cb [PubMed: 17667021]
- Ohar JA, & Donohue JF (2010). Mono- and combination therapy of long-acting bronchodilators and inhaled corticosteroids in advanced COPD. *Seminars in Respiratory and Critical Care Medicine*, 31, 321–333. 10.1055/s-0030-1254072 [PubMed: 20496301]
- Onishi H, Shirato H, Nagata Y, Hiraoka M, Fujino M, Gomi K, . . . Araki T (2011). Stereotactic body radiotherapy (SBRT) for operable stage I non-small-cell lung cancer: Can SBRT be comparable to surgery? *International Journal of Radiation Oncology, Biology, Physics*, 81, 1352–1358. 10.1016/j.ijrobp.2009.07.1751
- Palma D, Lagerwaard F, Rodrigues G, Haasbeek C, & Senan S (2012). Curative treatment of stage I non-small-cell lung cancer in patients with severe COPD: Stereotactic radiotherapy outcomes and systematic review. *International Journal of Radiation Oncology, Biology, Physics*, 82, 1149–1156. 10.1016/j.ijrobp.2011.03.005
- Pompili C, Brunelli A, Refai M, Xiumé F, & Sabbatini A (2010). Does chronic obstructive pulmonary disease affect postoperative quality of life in patients undergoing lobectomy for lung cancer? A case-matched study. *European Journal of Cardio-Thoracic Surgery*, 37, 525–530. 10.1016/j.ejcts.2009.09.025 [PubMed: 19850491]
- Price DB, Yawn BP, & Jones RC (2010). Improving the differential diagnosis of chronic obstructive pulmonary disease in primary care. *Mayo Clinic Proceedings*, 85, 1122–1129. 10.4065/mcp.2010.0389 [PubMed: 21123639]
- Probst VS, Troosters T, Coosemans I, Spruit MA, Pitta Fde O, Decramer M, & Gosselink R (2004). Mechanisms of improvement in exercise capacity using a rollator in patients with COPD. *Chest*, 126, 1102–1107. 10.1378/chest.126.4.1102 [PubMed: 15486370]
- Quist M, Rørth M, Langer S, Jones LW, Laursen JH, Pappot H, . . . Adamsen L (2012). Safety and feasibility of a combined exercise intervention for inoperable lung cancer patients undergoing chemotherapy: A pilot study. *Lung Cancer*, 75, 203–208. 10.1016/j.lungcan.2011.07.006 [PubMed: 21816503]
- Rafei H, El-Bahesh E, Finianos A, Nassereddine S, & Tabbara I (2017). Immune-based therapies for non-small-cell lung cancer. *Anticancer Research*, 37, 377–387. 10.21873/anticancer.11330 [PubMed: 28179283]

- Reck M, Rodríguez-Abreu D, Robinson AG, Hui R, Cs szí T, Fülöp A, . . . Brahmer JR (2016). Pembrolizumab versus chemotherapy for PD-L1-positive non-small-cell lung cancer. *New England Journal of Medicine*, 375, 1823–1833. 10.1056/NEJMoa1606774 [PubMed: 27718847]
- Renvall MJ, Friedman P, & Ramsdell JW (2009). Predictors of body mass index in patients with moderate to severe emphysema. *COPD*, 6, 432–436. 10.3109/15412550903433034 [PubMed: 19938965]
- Ries AL, Bauldoff GS, Carlin BW, Casaburi R, Emery CF, Mahler DA, . . . Herrerias C (2007). Pulmonary rehabilitation: Joint ACCP/AACVPR evidence-based clinical practice guidelines. *Chest*, 131(Suppl. 5), 4S–42S. 10.1378/chest.06-2418 [PubMed: 17494825]
- Schols AM (2002). Pulmonary cachexia. *International Journal of Cardiology*, 85, 101–110. 10.1016/S0167-5273(02)00238-3 [PubMed: 12163214]
- Schook RM, Linssen C, Festen J, Schramel FM, Lammers E, Zaanen P, & Postmus PE (2013). Website visitors asking questions online to lung cancer specialists: What do they want to know? *Interactive Journal of Medical Research*, 2, e15 10.2196/ijmr.1749 [PubMed: 23919980]
- Sekine Y, Yamada Y, Chiyo M, Iwata T, Nakajima T, Yasufuku K, . . . Fujisawa T (2007). Association of chronic obstructive pulmonary disease and tumor recurrence in patients with stage IA lung cancer after complete resection. *Annals of Thoracic Surgery* 84, 946–950. 10.1016/j.athoracsur.2007.04.038 [PubMed: 17720404]
- Shennan C, Payne S, & Fenlon D (2011). What is the evidence for the use of mindfulness-based interventions in cancer care? A review. *Psycho-Oncology*, 20, 681–697. 10.1002/pon.1819. [PubMed: 20690112]
- Shinde AM, & Dashti A (2016). Palliative care in lung cancer In Reckamp KL (Ed.), *Lung cancer: Treatment and research* (pp. 225–250). Cham, Switzerland: Springer International Publishing.
- Skillrud DM, Offord KP, & Miller RD (1986). Higher risk of lung cancer in chronic obstructive pulmonary disease. A prospective, matched, controlled study. *Annals of Internal Medicine*, 105, 503–507. 10.7326/0003-4819-105-4-503 [PubMed: 3752756]
- Solway S, Brooks D, Lau L, & Goldstein R (2002). The short-term effect of a rollator on functional exercise capacity among individuals with severe COPD. *Chest*, 122, 56–65. 10.1378/chest.122.1.56 [PubMed: 12114339]
- Sommer MS, Trier K, Vibe-Petersen J, Christensen KB, Missel M, Christensen M, . . . Langberg H (2016). Changes in health-related quality of life during rehabilitation in patients with operable lung cancer: A feasibility study (PROLUCA). *Integrative Cancer Therapies*, 10.1177/1534735416668258
- Soubeyran P, Fonck M, Blanc-Bisson C, Blanc JF, Ceccaldi J, Mertens C, . . . Rainfray M (2012). Predictors of early death risk in older patients treated with first-line chemotherapy for cancer. *Journal of Clinical Oncology* 30, 1829–1834. 10.1200/JCO.2011.35.7442 [PubMed: 22508806]
- Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C, . . . Wouters EF (2013). An official American Thoracic Society/European Respiratory Society statement: Key concepts and advances in pulmonary rehabilitation. *American Journal of Respiratory and Critical Care Medicine*, 188, e13–e64. 10.1164/rccm.201309-1634ST [PubMed: 24127811]
- Stoller JK, Panos RJ, Krachman S, Doherty DE, & Make B (2010). Oxygen therapy for patients with COPD: Current evidence and the long-term oxygen treatment trial. *Chest*, 38, 179–187. 10.1378/chest.09-2555
- Sulku J, Hogman M, Stallberg B, Malinovschi A, Lisspers K, Nielsen E, . . . Hammarlund-Udenaes M (2016). Incorrect inhaler technique is common in patients with COPD-Data from the TIE study. *European Respiratory Journal*, 48(Suppl. 60). 10.1183/13993003.congress-2016.PA3945
- Tarumi S, Yokomise H, Gotoh M, Kasai Y, Matsuura N, Chang SS, & Go T (2015). Pulmonary rehabilitation during induction chemoradiotherapy for lung cancer improves pulmonary function. *Journal of Thoracic and Cardiovascular Surgery*, 149, 569–573. 10.1016/j.jtcvs.2014.09.123 [PubMed: 25451483]
- Uronis HE, Ekström MP, Currow DC, McCrory DC, Samsa GP, & Abernethy AP (2015). Oxygen for relief of dyspnoea in people with chronic obstructive pulmonary disease who would not qualify for home oxygen: A systematic review and meta-analysis. *Thorax*, 70, 492–494. 10.1136/thoraxjnl-2014-205720 [PubMed: 25472664]

- Valderas JM, Starfield B, Sibbald B, Salisbury C, & Roland M (2009). Defining comorbidity: Implications for understanding health and health services. *Annals of Family Medicine*, 7, 357–363. 10.1370/afm.983 [PubMed: 19597174]
- van Dijk W, Tan W, Li P, Guo B, Li S, Benedetti A, & Bourbeau J (2015). Clinical relevance of fixed ratio vs lower limit of normal of FEV1/FVC in COPD: Patient-reported outcomes from the CanCOLD cohort. *Annals of Family Medicine*, 13, 41–48. 10.1370/afm.1714 [PubMed: 25583891]
- van Ranst D, Stoop WA, Meijer JW, Otten HJ, & van de Port IG (2014). Reduction of exacerbation frequency in patients with COPD after participation in a comprehensive pulmonary rehabilitation program. *International Journal of Chronic Obstructive Pulmonary Disease*, 9, 1059–1067. 10.2147/COPD.S69574 [PubMed: 25336938]
- Varricchio CG, & Ferrans CE (2010). Quality of life assessments in clinical practice. *Seminars in Oncology Nursing*, 26, 12–17. 10.1016/j.soncn.2009.11.003 [PubMed: 20152574]
- Vitacca M, Clini E, Bianchi L, & Ambrosino N (1998). Acute effects of deep diaphragmatic breathing in COPD patients with chronic respiratory insufficiency. *European Respiratory Journal*, 11, 408–415. 10.1183/09031936.98.11020408 [PubMed: 9551746]
- Vogelmeier C, Hederer B, Glaab T, Schmidt H, Rutten-van Mölken MP, Beeh KM, . . . Febbri LM (2011). Tiotropium versus salmeterol for the prevention of exacerbations of COPD. *New England Journal of Medicine*, 364, 1093–1103. 10.1056/NEJMoa1008378 [PubMed: 21428765]
- Welte T (2009). Optimising treatment for COPD-New strategies for combination therapy. *International Journal of Clinical Practice*, 63, 1136–1149. 10.1111/j.1742-1241.2009.02139.x [PubMed: 19624783]
- Williams AC, Grant M, Tjep B, Kim JY, & Hayter J (2012). Dyspnea management in early stage lung cancer: A palliative perspective. *Journal of Hospice and Palliative Nursing*, 14, 341–342. 10.1097/NJH.0b013e31825e4250 [PubMed: 24058283]
- Young RP, Hopkins RJ, Christmas T, Black PN, Metcalf P, & Gamble GD (2009). COPD prevalence is increased in lung cancer, independent of age, sex and smoking history. *European Respiratory Journal*, 34, 380–386. 10.1183/09031936.00144208 [PubMed: 19196816]
- Zheng X, Schipper M, Kidwell K, Lin J, Reddy R, Ren Y, . . . Spring Kong FM (2014). Survival outcome after stereotactic body radiation therapy and surgery for stage I non-small cell lung cancer: A meta-analysis. *International Journal of Radiation Oncology Biology Physics*, 90, 603–611. 10.1016/j.ijrobp.2014.05.055

“Psychological dependence is a powerful issue, and stress is a common reason cited for smoking resumption.”

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IMPLICATIONS FOR PRACTICE

- Encourage interprofessional discussions with patients with lung cancer and their family members to address the many aspects of their physical and emotional well-being rather than just their cancer diagnosis.
- Provide nurses and other team members with information for patients and family members to pursue aggressive attempts at smoking cessation with attainable, cost-effective options that they can access easily.
- Use pharmacologic and nonpharmacologic treatment strategies to alleviate the symptom burden from lung cancer with chronic obstructive pulmonary disease.

CNE ACTIVITY**EARN 0.5 CONTACT HOURS**

ONS members can earn free CNE for reading this article and completing an evaluation online. To do so, visit cjon.ons.org/cne to link to this article and then access its evaluation link after logging in.

Certified nurses can claim no more than 0.5 total ILNA points for this program. Up to 0.5 ILNA points may be applied to Symptom Management OR Professional Practice. See www.oncc.org for complete details on certification.

AMERICAN LUNG ASSOCIATION

Professional and patient support services, including the Lung HelpLine and Tobacco QuitLine (both free). Freedom From Smoking® is a face-to-face smoking cessation group program. Freedom From Smoking Plus is a new online smoking cessation resource.

- www.lung.org

AMERICAN SOCIETY OF CLINICAL ONCOLOGY

A membership-only program for oncology providers to integrate tobacco cessation counseling services into their practice setting. The Tobacco Cessation Provider Toolkit includes an evidence-based guide for professionals, a patient companion booklet, and practice tools and resources.

- www.cancer.net

JOINT COMMISSION

Resources (both free to download) include "Helping Patients Quit: Implementing the Joint Commission Tobacco Measure Set in Your Hospital" (a 40-page booklet describing implementation strategies and successful case studies) and "Keeping Your Hospital Property Smoke-Free."

- www.jointcommission.org

NATIONAL CANCER INSTITUTE (NCI)

Information about NCI-funded tobacco-related research, the Smoking Quitline, relevant websites, and free smoking cessation publications

- www.cancer.gov/about-cancer/causes-prevention/risk/tobacco

RX FOR CHANGE: CLINICIAN-ASSISTED TOBACCO CESSATION

A comprehensive program—hosted by the University of California, San Francisco, Schools of Pharmacy and Medicine—designed to enhance tobacco cessation education among healthcare professionals. Rx for Change is a resource for smoking cessation medications and potential drug interactions. Website registration is required (free of charge).

- www.rxforchange.ucsf.edu

TOBACCO FREE NURSES

The first national (United States) program created to help nurses quit smoking, provide resources to nurses who want to help their patients quit, and promote tobacco control within nursing organizations. The website lists links to programs and resources, including a library of articles about smoking cessation.

- www.tobaccofreenurses.org

UNIVERSITY OF WISCONSIN SCHOOL OF MEDICINE

The no-fee program "Tobacco Use and Dependence: An Updated Review of Treatments" is designed to educate professionals who provide health care to tobacco users.

- www.ocpd.wisc.edu

FIGURE 1.
TOBACCO-RELATED CESSATION RESOURCES FOR PROVIDERS

BETTER BREATHERS CLUB®

A support group for patients with chronic lung disease and their family members. Groups meet regularly and feature educational presentations on a wide range of relevant topics, including how chronic obstructive pulmonary disease affects the lungs and breathing techniques.

- www.lung.org/support-and-community/better-breathers-club

CRAVING TO QUIT®

A 21-day mindfulness-based smoking cessation program (available at a fee) and an example of a mobile application for smoking cessation

- www.cravingtoquit.com

FREE TO BREATHE

A nonprofit partnership of lung cancer survivors, advocates, researchers, healthcare professionals, and industry leaders, united by a belief that every person with lung cancer deserves a cure

- www.freetobreathe.org

LUNG CANCER ALLIANCE (LCA)

A nonprofit organization dedicated to fighting lung cancer in the United States, with a mission of saving lives and advancing research by empowering those living with and at risk for lung cancer. LCA offers a help line; a peer-support program, the Phone Buddy Program; and an online support community. An LCA Unite mobile application provides a platform for tracking treatment side effects and locating support groups and lung cancer Screening Centers of Excellence and clinical trials.

- www.lungcanceralliance.org

LVNG WITH LUNG CANCER

A community of people living with lung cancer who are inspiring one another to face each day with authenticity and hope; supported by AstraZeneca

- www.lvng.com

FIGURE 2.
SMOKING CESSATION SUPPORT GROUPS FOR PATIENTS AND FAMILY MEMBERS

THE AMERICAN COLLEGE OF PHYSICIANS, AMERICAN COLLEGE OF CHEST PHYSICIANS, AND AMERICAN THORACIC SOCIETY

Diagnosis and Management of Stable COPD

- www.thoracic.org/statements/resources/copd/copd-guideline-acp-ats-ers-accp%20-abstract.pdf

GLOBAL INITIATIVE FOR COPD

Global Strategy for the Diagnosis, Management, and Prevention of COPD

- www.goldcopd.org/download/120

NCCN CLINICAL PRACTICE GUIDELINES IN ONCOLOGY (NCCN GUIDELINES®)

Cancer-Related Fatigue [v.2.2018]

- www.nccn.org/professionals/physician_gls/pdf/fatigue.pdf

Distress Management [v.1.2018]

- www.nccn.org/professionals/physician_gls/pdf/distress.pdf

Palliative Care [v.1.2018]

- www.nccn.org/professionals/physician_gls/pdf/palliative.pdf

ONCOLOGY NURSING SOCIETY

PEP (topics include dyspnea and fatigue management)

- www.ons.org/practice-resources/pep

COPD—chronic obstructive pulmonary disease; NCCN—National Comprehensive Cancer Network; PEP—Putting Evidence Into Practice

FIGURE 3.
GUIDELINES FOR THE MANAGEMENT OF SYMPTOMS EXPERIENCED BY PATIENTS WITH LUNG CANCER AND COPD

TABLE 1.**GOLD CRITERIA FOR DIAGNOSING AND STAGING COPD**

GOLD STAGE	COPD DIAGNOSIS	FEV1/FVC RATIO	FEV1 VALUE
I	Mild	Less than 0.7	80% or greater normal
II	Moderate	Less than 0.7	50%–79% normal
III	Severe	Less than 0.7	30%–49% normal
IV	Very severe	Less than 0.7	Less than 30% normal (or less than 50% normal when chronic respiratory failure is present)

COPD—chronic obstructive pulmonary disease; FEV1—forced expiratory volume; FVC—forced vital capacity; GOLD—Global Initiative for Chronic Obstructive Lung Disease

Note. From “Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease,” by GOLD, 2016. Retrieved from <http://goldcopd.org/download/120>. Copyright 2016 by GOLD. Adapted with permission.