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Caring for the Older Person with Chronic Obstructive Pulmonary Disease: "I was worried that he didn't have much room to decline"

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Abstract

Chronic obstructive pulmonary disease (COPD) is a common disease in elderly patients. It is characterized by high symptom burden, healthcare utilization, mortality, and unmet needs of both patients and their caregivers. The treatment of the older patient with COPD is highly challenging. Although COPD is a major cause of respiratory failure and dyspnea in the elderly, multiple other disease entities, including heart failure, pulmonary embolism, and anxiety; medication effects; and other conditions, including deconditioning and malnutrition; may exacerbate COPD symptoms. Randomized controlled trials, which provide the strongest evidence for guideline recommendations, may underestimate the risk of adverse effects of interventions for older patients with COPD. The focus of guidelines on disease-modifying therapies may not address the full spectrum of both patient and caregiver needs engendered by the increasing burdens of advanced disease, particularly the high rates of bothersome symptoms, risk of functional and cognitive decline, and need for end-of-life care planning. Older patients tend to have a substantial disease burden coupled with functional and cognitive decline complicating the successful implementation of COPD treatments. Meeting the many needs of older COPD patients and their families requires that clinicians supplement guideline-recommended care with treatment decision making that takes into account older persons' comorbid conditions, recognizes the trade-offs engendered by the increased risk of adverse events, focuses on symptom relief and function, and prepares patients and their loved ones for further declines in the patient's health and their end-of-life care.

A case of COPD in an 81 year old man hospitalized with severe dyspnea and respiratory failure is presented. This case highlights both the challenges in managing COPD in the elderly and the limitations in applying guidelines to geriatric patients.

Patient Story

Acute exacerbation of dyspnea brought Mr V to the hospital. He is 81-years-old with COPD complicated by hypertension, depression, post-traumatic stress disorder, heart failure, coronary artery disease, diabetes mellitus, hyperlipidemia, glaucoma, diverticulosis coli, and neck injury from a motor vehicle accident. He has a >50 pack-year smoking history, but quit at age 50.. COPD was diagnosed 10 years before when spirometry showed an FEV1 of 63% of predicted. Home oxygen at 2 liters per minute was begun 3 years later. Mr. V's

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respiratory status was gradually deteriorating, manifested by the inability to walk beyond 1/2 block without the need to rest. has

His medications include three inhalers: albuterol 90 mcg 1–2 puffs every 6 hours as needed; formoterol 12 mcg twice daily; and mometasone 220 mcg twice daily. Mr. V also takes eleven oral medications: aspirin 81 mg daily; lisinopril 10 mg daily; metformin 500 mg twice daily; simvastatin 40 mg orally nightly; omeprazole 20 mg twice daily; cholecalciferol 1000 international units daily; buspirone 15 mg daily; sertraline 200 mg daily; mirtazapine 30 mg nightly, triazolam 0.125 mg nightly as needed, oxycodone/acetaminophen 10/650 mg every 6 hours as needed; and three eye drops: carboxymethylcellulose 1 drop 4 times daily; dorzolamide 2% solution 1 drop twice daily, travoprost 0.004% solution 1 drop at bedtime.

Mr. V's wife developed Alzheimer disease, moved into a nursing home and subsequently died. He has 2 sons. Mr. V. moved to an assisted living facility in anticipation of declining health. Prior to the move he was involved in several social organizations, but now most of his friends are gone. Mr. V's advance directive calls for treatment of all potentially reversible conditions, with the exception of CPR or artificial ventilation in the case of a catastrophic event. Mr. V's younger son is his health care proxy.

Geriatric functional assessment revealed independence in his Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) with the exception of household chores and shopping resulting from his lack of mobility. A walker and scooter are needed to travel long distances. Mr. V recently fell when using his scooter.

Mr. V. had difficulty in talking because of his shortness of breath when evaluated in the Emergency, Department He was feeling fine the night before but awoke feeling very short of breath. Physical examination revealed vital signs of: T 98.4 F; P 114; BP 169/80; and R 30. He was observed to be experiencing moderate respiratory distress. Apart from his lungs, which showed poor air movement with bilateral expiratory wheezes, his physical examination was unremarkable. Mr V had a tachycardic regular rhythm with a normal S1 and S2, no murmurs on his heart examinaton. He scored 9/15 on the Geriatric Depression Scale and 29/30 on the Mini-Mental State Examination.

His hemoglobin was 11.4 g/dL, hematocrit 33.6%, MCV 81.8, and WBC 23,300. Serum electrolytes, creatinine and BUN were normal. Chest radiography showed large lung fields, but no infiltrates or effusions. The pH was 7.19, pCO2 66.1 mm Hg, pO2 55.8 mm Hg, O2 saturation 80.3%. Sputum was unobtainable.

A diagnoses of COPD exacerbation was made and systemic methylprednisolone sodium, ceftriaxone, and azithromycin administered. Initially, Mr. V was admitted to the ICU and placed on BiPAP overnight. On the first hospital day, oral prednisone 40 mg daily was started with a plan to be continue it for 5 days. Oral Levofloxacin 750 mg/day was started as was albuterol and ipratropium nebulizations every 2 hours. Following transfer to the general medicine floor, the albuterol nebulizations were changed to 1–2 puffs every 6 hours, and he was begun on inhalations of formoterol 12 mcg, twice daily, tiotropium bromide 18 mcg daily, and mometasone 220 mcg twice daily. He continued his usual medications for his other comorbid conditions. Mr. V's respiratory status gradually improved and he was discharged back to his assisted care facility after 4 days in the hospital.

PERSPECTIVE

Mr V: As soon as I exert myself, I'm breathless…if I walk from the dining room to the mailbox, which is maybe 100 feet, I'll have to stop twice.

> Dr G: My impression … was [of] somebody who had very advanced lung disease.

COPD disease management guidelines provide a synthesis of a strong evidence base for the diagnosis and treatment of both the stable phase and acute exacerbations of COPD. However, the application of guideline-directed care has not consistently demonstrated good outcomes and recent evidence suggests complexities not yet fully understood.[1]

As Mr V's experience illustrates, guidelines are limited when applied to older patients with dyspnea and respiratory failure for a number of reasons. First, both acute episodes of respiratory failure and chronic dyspnea are likely to be multifactorial. Treatment paradigms will be influenced by the interaction of a variety of diseases and impairments in addition to COPD itself. Second, the diagnosis and staging of COPD itself requires special consideration. Third, guidelines may not address the full spectrum of patient needs resulting from the burdens of advanced disease, particularly the high risk of functional and cognitive decline and need for end-of-life care planning. Fourth, the grading of the evidence base for interventions presented in guidelines can under-estimate the prevalence of adverse events for older patients and patients with multiple medical conditions. Finally, although most guidelines recognize the importance of comorbid conditions, they do not always account for the potential adverse consequences of polypharmacy.

COPD disease management guidelines provide a comprehensive summary of many components of Mr V's care, and we refer the reader to these guidelines for details of the evidence base underlying these components.[2,3] In this paper, we focus on the components of care for which the clinician needs to look beyond the guidelines to address older patient with COPD, severe dyspnea, and respiratory failure.

The multifactorial nature of dyspnea and respiratory failure in an older patient with COPD

> Mr V: I had woken up in the middle of the night to go to the bathroom and I couldn't breathe. I called for security and they got an ambulance for me. I woke up at the VA hospital and I was in the ICU.

Mr. V presented with acute-on-chronic respiratory failure manifested by severe dyspnea resulting from inadequate gas exchange., His long-standing oxygen dependency indicates chronic hypoxemic respiratory failure and, his respiratory acidosis is a manifestation of acute hypercapneic respiratory failure. Rather than being considered solely as a manifestation of COPD, Mr. V's dyspnea and respiratory failure necessitate consideration of multiple domains. One domain contributing to both dyspnea and respiratory failure is a reduction in ventilatory capacity. Before being hospitalized, Mr. V had manifestations of severely reduced ventilatory capacity due to advanced COPD. His pre-hospital pulmonary function tests showed irreversible airflow limitation (reduced FEV_1/FVC of 0.42) associated with hyperinflation (total lung capacity of 164 percent predicted) and abnormal gas exchange (reduced diffusion capacity for carbon monoxide [DL_{CO}] of 54 percent predicted). Based on these features—especially in the setting of prior tobacco use—airways obstruction due to COPD is a major contributor to his decreased ventilatory capacity.[2,4]. Mr. V's COPD is classified as moderate based on criteria from the Global Initiative for Obstructive Lung Disease (GOLD), since his most recent FEV_1 was 68 percent predicted.[2] Respiratory failure and disabling dyspnea are not usually complicating features of moderate COPD. An alternative staging strategy that rigorously accounts for age-related changes in pulmonary function and variability in spirometric performance, the Lambda-Mu-Sigma [LMS] method, demonstrates that 28.1% of severe COPD is classified as moderate by GOLD.[5] Accurate classification of COPD is essential for the appropriate attribution of symptoms and use of COPD-directed therapies.

Table 1 summarizes causes of reduced ventilatory capacity. Mr V's presentation suggests pathophysiology other then COPD such as heart failure (HF)[9,10]. Acute pulmonary thromboembolism must be considered since Mr. V's dyspnea had increased abruptly on admission,. Post-mortem studies of patients hospitalized for what was initially thought to be a COPD exacerbation (n=43, median age 70) revealed that HF was present in 16 (37%) and pulmonary thromboembolism in 9 (21%) patients.[6] Mr. V may have respiratory muscle weakness from fatigue related to increased work of breathing because of his COPD). Respiratory muscle weakness can also be caused by sarcopenia caused by COPD, HF, diabetes, and advanced age. He also might have suffered a phrenic nerve injury related to a neck injury in a motor vehicle accident.[7] Mr. V is taking medications that reduce ventilatory capacity: 1) concurrent use of opiates and benzodiazepines decreases ventilatory control and increases the risk of recurrent aspiration, and 2) statins and systemic corticosteroids may cause myopathy of respiratory muscles. Corticosteroids may cause osteoporosis-related kyphoscoliosis influencing the chest wall configuration that reduces breathing efficiency.[8–10] The interaction between these medication effects and age-related reductions in ventilatory control, respiratory mechanics, respiratory muscle strength, and gas exchange[11] potentially contribute to the occurrence of pneumonia (28%) and respiratory failure (14%) as established causes of death among older persons hospitalized for a COPD exacerbation.[6]

A second domain contributing to dyspnea is an increased ventilatory demand. Increased oxygen demands of muscle during periods of exercise increases ventilatory requirements.[12,13] If the exercising muscle has a reduced aerobic capacity, the ventilatory demand increases further because of the carbon dioxide load resulting from anaerobic metabolism.[12,13] As occurred in Mr. V's, increases in ventilatory demand accompanying exercise results in severe dyspnea, including during activities of daily living. Older persons are especially burdened by a multiplicity of impairments reducing aerobic capacity. For Mr. V these case, these may include low cardiac output from HF, COPD with cor pulmonale, and pulmonary hypertension caused by chronic pulmonary thromboembolism); Aerobic capacity might also be compromised by anemia that reduces arterial oxygen. Similarly, muscular sarcopenia in the muscles of ambulation caused by COPD, HF, diabetes, malnutrition, advanced age, and deconditioning can reduce aerobic capacity as can medication-related adverse effects such as postural hypotension from lisinopril, sertraline, and mirtazapine, loss of balance fromoxycodone, triazolam, buspirone, albuterol, formoterol, and omeprazole, and myopathy related to simvastatin, methylprednisolone, and prednisone..

Summarized in Table 2, psychosocial and environmental factors unrelated to cardiopulmonary physiology can contribute to dyspnea.[14–17] Mr. V has psychosocial burdens, including depression, post-traumatic stress disorder, (PTSD), chronic back pain, and social isolation. Moreover, Mr. V may also face environmental barriers, such as the distance he needs to walk to get to his meals, that worsen his dyspnea. Because these psychological and environmental factors are independently associated with dyspnea, physiologic measures such as FEV_1 and ejection fraction, although important in establishing disease and predicting adverse outcomes, cannot by themselves fully explain the experience of dyspnea.[15,16,18,19]

A comprehensive approach to the diagnosis and treatment of respiratory failure and dyspnea in the older patient with COPD

Dr G: I usually try to prioritize people's health problems in my mind. So, I wrote in my notes that his main issue was COPD and he was oxygen dependent. That was driving the treatment plan. … the plan was to mainly optimize his function with

> lung disease, try to prevent decline, and optimize and streamline his treatments for his other chronic conditions… and also a significant psychiatric constellation which included PTSD and depression.

In the acute setting, especially during an ICU admission, the focus is on cardiopulmonary physiology, since reduced ventilatory capacity and cardiac output are likely to be the predominant underlying mechanisms for respiratory failure.[2] Acute clinical management is guided primarily by assessments of COPD and HF exacerbations, pulmonary thromboembolism, and medication-related adverse effects (Table 1). Evidence-based guidelines are available for HF and pulmonary thromobembolism treatment.[20,21] Once leaving the ICU, clinical management should include consideration of additional determinants of increased ventilatory demand such as reduced physical function and dyspnea including psychosocial and environmental factors (Table 2).

COPD guidelines summarize the evidence supporting the use of inhaled beta-agonist and anticholinergic agents, and, for patients with severe COPD, inhaled corticosteroids and phosphodiesterase-4 inhibitors.[2,3] However, among older patients with comorbid conditions, greater caution and more vigilant monitoring for adverse effects of these agents above and beyond what is in the guidelines is necessary. For example, guidelines present inhaled bronchodilators as having few adverse effects.[2] This may not be the case for elderly patients like Mr. V. Information regarding adverse events is obtained from the same RCTs that provide information regarding medication efficacy. Increasingly however, it is recognized that RCTs underestimate the likelihood of adverse events,[22,23] This is in part because the generally relatively small sample sizes for these studies, while sufficient to establish efficacy, may not be sufficient to demonstrate complications. The studies also have relatively short follow-up and incomplete ascertainment of adverse events. Even more important is the exclusion of patients from RCTs who have risk factors for adverse effects. While pooled analysis of several trials reported increased risks for cardiovascular events and mortality with use of inhaled anticholinergics,[24] one large RCT that did not demonstrate this association excluded patients with previous myocardial infarction, heart failure, or preexisting arrhythmias.[25,26] While there are no studies among patients with COPD examining the representativeness of patients in clinical trials, it has been shown that patients in RCTs for coronary intervention are younger and healthier than patients in clinical practice.[27] Observational studies may help to clarify the spectrum of medication adverse effects.[28] Studies of inhaled beta-adrenergics showed increases in urinary retention associated with inhaled anticholinergics[29] and greater risk for mortality and heart failure exacerbation among COPD and heart failure patients [30] Taken together, these studies demonstrate a need for caution when prescribing medications to patients with risk factors for conditions that may be exacerbated by these therapies. Older patients with multiple comorbidities should be monitored closely for improvement in target symptoms and for adverse events from prescribed medications.

Evidence also suggests that provision of COPD guideline-directed therapies is not sufficient to relieve dyspnea with advancing illness. Although they have not reported on the proportion of patients who were receiving maximal guideline-directed care, studies have demonstrated that breathlessness is a nearly universal symptom in advanced COPD, occurring in 90–95% of individuals.[31] Other common symptoms include pain (34–77%), fatigue (68–80%), insomnia (55–65%), and anorexia (35–67%). Patients with advanced lung disease require symptom-directed, palliative care coordinated with their COPD-directed treatment. Patients with advanced COPD have a similar or worse symptom burden and quality of life than those with advanced lung cancer but are given less palliative care.[32–34] The American Thoracic Society adopted a position in 2008 regarding patients with respiratory disease, stating that

treating symptoms “without affecting a cure” must become an integral component of standard care.[35]

The evidence base regarding treatment of symptoms is much limited relative to that for COPD-directed pharmacologic treatments.[36] Several treatment approaches for symptom control, including opioids for refractory dyspnea, are generally safe, adequately researched, and increasingly accepted and recommended for use in COPD patients.[35,37,38] Biases and fears about opioid use persists among care providers precluding their most effective use.[39]Box 1 outlines evidence-based suggestions for palliative treatments of dyspnea.

BOX 1

Management of Dyspnea for Older Patients with COPD[1]

Pharmacologic Treatments	Strength of Evidence of Efficacy[2]	Comments
COPD Medications: Inhaled beta2-agonists (long- and short-acting), Inhaled anticholinergics (long- and short-acting), Inhaled and systemic corticosteroids, methlyxanthines, phosphodiesterase-4 inhibitors[2,3]	Good evidence based on multiple randomized trials for individual medications and various combinations. See COPD guidelines for grading of evidence	COPD-directed treatments are most effective earlier in the course of disease. Non-adherence may occur as a consequence of cognitive, upper-extremity, and mouth-based impairments (i.e. inhaler use) or in response to treatment-related adverse effects, since these occur more frequently with advancing age.
Opioids[85–88]	Good evidence from systematic review (mostly small studies)	Opioids are key to treating refractory dyspnea, but may cause bothersome side effects including constipation, urinary retention, and confusion. Have been studied in older patients. No added benefit from nebulization.
Benzodiazepines[89,90]	Mixed	Benzodiazepines are considered third-line (after opioids and oxygen), primarily useful for dyspnea-related anxiety and carry significant risks for elderly patients.
Nebulized furosemide[85,91,92]	Insufficient	A few initial studies are encouraging
Heliox[93,94]	Insufficient	Studied primarily in the setting of exercise training (not breathlessness) in COPD

Non-Pharmacologic Treatments	Strength of Evidence of Efficacy	Comments
Pulmonary Rehabilitation, including exercise, education, breathing techniques (purse- lipped), psychological support[15]	Good	Pulmonary Rehabilitation may also provide social support important to elderly patients.
Supplemental Oxygen[95]	Good evidence, with benefit demonstrated for patients with hypoxia but no benefit for patients without hypoxia (PaO_2>55mm Hg).	The benefits of supplemental oxygen may be available only to patients with hypoxia, but some clinicians offer a therapeutic trial of supplemental oxygen given its low morbidity and the possibility that some individual patients may experience benefit. Has been studied in older patients.

[1]Influenza and pneumococcal vaccines may be useful for older patients with COPD at preventing dyspnea by preventing infections and COPD exacerbations. Prophylactic antibiotics have more limited supporting evidence. However, antibiotics to treat infections causing COPD exacerbations are effective.

Non-Pharmacologic Treatments	Strength of Evidence of Efficacy	Comments
Cigarette cessation[96]	Good evidence for symptomatic improvement, but benefits for reducing dyspnea may be delayed by a number of weeks	Cigarette cessation may provide no benefit at the end of life.
Lung Surgery • Lung-volume Reduction Surgery[97] • Minimally-Invasive Lung-volume Reduction[98] • Lung transplantation	Good evidence of benefit for highly-selected patients	Lung surgery may not be desired or appropriate for elderly patients, especially those with significant surgical risks from cardiovascular disease.
Non-invasive ventilation[99,100]	Mixed	Recent systematic review demonstrated mixed results with only 2 of 4 included studies demonstrating significant improvement in dyspnea.
Blowing cool air, Fans[101]	Insufficient	Limited evidence of benefit but therapeutic trial justified in light of minimal morbidity.
Acupuncture[102]	Insufficient	Limited evidence of benefit but therapeutic trial may be justified in light of minimal morbidity.
Nutrition[103]	Insufficient	Unlikely to be beneficial for dyspnea: meta-analysis of randomized trials showed no benefit on outcomes, including for 3 of 11 included studies that evaluated dyspnea.

[2]Good: multiple well-done trials; Mixed: data from multiple studies inconsistent; Insufficient: limited evidence.

[1]Influenza and pneumococcal vaccines may be useful for older patients with COPD at preventing dyspnea by preventing infections and COPD exacerbations. Prophylactic antibiotics have more limited supporting evidence. However, antibiotics to treat infections causing COPD exacerbations are effective.

Pulmonary rehabilitation should be a critical component of Mr. V's management since it addresses many of the contributors to dyspnea.[2,15] Pulmonary rehabilitation includes lower and upper extremity exercise training, physiotherapy techniques, education, and psychosocial support. Evidence-based guidelines conclude that pulmonary rehabilitation improves dyspnea, health-related quality-of-life, and psychosocial outcomes.[13,15,16] Two small observational studies of pulmonary rehabilitation demonstrated equivalent outcomes for for older and younger patients.[40,41] One study has shown that participants with the greatest physiological impairments achieve the greatest improvement in exercise capacity.[42]

Functional and cognitive disability among persons with advanced COPD

Mr V: What prompted me to move was that I was getting on in years and getting too decrepit to maintain the property and the house.

Dr G: The … thing that is very common in older folks is that there is less reserve in physical function than in a younger person. So an 80-year old with advanced lung disease, and also several other chronic diseases and pain, his actual physical functioning may be more limited than in somebody with COPD in a younger age and without some of the other chronic conditions.

Dyspnea is strongly associated with functional disability among persons with COPD,[43] and the approach to maximizing functional capacity overlaps with the approach to treating dyspnea. Both aging[44] and COPD[45,46] contribute to an increased risk of physical and cognitive impairments, which, in turn, are risk factors for the development of functional disability, or the inability to complete tasks associated with daily living. While effective therapies are limited to reverse cognitive impairment and functional disability, it is important nonetheless for the clinician to recognize their presence. Functional disability is a predictor of multiple outcomes among older persons, including mortality[47,48] and nursing home placement.[49] In addition, disability determines care needs and the clinician must evaluate whether the patient has sufficient support to carry out tasks of daily living. For Mr. V, recognition of his risk for worsening function led to his decision to move to an assisted living facility. Cognitive deficits can interfere with a patient's ability to adhere to complex medical regimens and use inhalation devices accurately.[50,51]

Older patients with COPD are at risk for other conditions that contribute to functional disability. COPD is associated with both osteoporosis and fall risk factors, which greatly increase the risk of hip fractures, a major cause of disability amongst the elderly.. A systematic review found that the prevalence of osteoporosis in COPD varies from 9% to 69%, depending upon the population studied, with an overall prevalence of 35%.[52] Although there have been no large studies evaluating the prevalence of falls among persons with COPD, one small study demonstrated a high rate of falls among persons with COPD recruited from pulmonary rehabilitation.[53] COPD patients have a high prevalence of fall risk factors including gait and balance impairments, muscle weakness, and nutritional deficits.[54]

Table 3 provides recommendations for evaluation and management of functional decline. Formal evaluation of the patient's functional status includes activities of daily living (ADLs) and instrumental or intermediate activities of daily living (IADLs). ADLs consist of basic self-care tasks, such as bathing, dressing, toileting, continence, grooming, feeding, and transferring. IADLs are higher-order tasks necessarily to live independently in the community, including shopping, cooking, driving or using public transportation, using the telephone, housework, laundry, taking medications, and handling finances. Assessment of these activities must be accompanied by an evaluation of available social support to determine needs for higher levels of care..[55] For patients with functional disability, a comprehensive home evaluation can determine needs for modifications in the home environment to reduce dyspnea and improve function. Examples of home modifications include alternatives to stairs ()such as a chair glide)_ or creating living spaces on a single floor. Social isolation must be avoided by addressing transportation needs and identifying resources for social engagement such as senior centers.

Screening for cognitive impairment can be performed using one of several brief validated instruments. The Mini-Cog provides an assessment of both short-term memory and executive function.[56] Hypoxemia has been shown to be a risk factor for cognitive impairment in some studies.[57] In one large cohort study, use of supplemental oxygen was associated with a lower risk of cognitive impairment,[46] and, in a randomized controlled trial, continuous oxygen therapy was associated with modest improvements in some, but not all, tests of cognitive function after 6 months of therapy.[58] There is a growing body of evidence that exercise may be associated with improved cognitive performance.[57,59] Together with the evidence for improvements in dyspnea and physical functioning, this provides additional support for the utility of pulmonary rehabilitation in addressing a wide variety of health outcomes in COPD.

Patients should also be screened for comorbid conditions associated with an increased risk of disability. Although there is limited evidence regarding depression and anxiety screening

in COPD patients, the 3-question anxiety and 2-question depression items from the Primary Care Evaluation of Mental Disorders (PRIME-MD)[60] have demonstrated utility as an easily administered screening tool with good positive predictive value.[61,62] Only one small, randomized controlled trial of patients with COPD has examined the efficacy of pharmacologic therapy for depression treatment. This study showed the superiority of nortriptyline over placebo for treatment of depression, anxiety, and panic attacks in COPD patients.[63] There is preliminary evidence that cognitive behavioral therapy may improve depression and anxiety.[64,65] Additionally, several studies have demonstrated the utility of pulmonary rehabilitation in improving symptoms of depression and anxiety.[66] In the absence of COPD-specific data, it has been recommended that patients who have low BMI and/or treatment with corticosteroids should be screened for osteoporosis by DEXA scanning and serum 25-OH vitamin D levels. Patients with osteoporosis or with osteopenia and either a prior fracture or use of systemic steroids should be treated with calcium, vitamin D, and an anti-resorptive agent.[52,67] In the absence of data specific to patients with COPD, algorithms for screening, evaluating, and treating fall risk factors developed for use in the general geriatric population can be used in COPD.[68]

Decision making in the face of trade-offs

> Mr V: [Doctors should] [l]isten thoroughly to what the problems are and not just give you the quick touch.
>
> Dr G: As with other diseases in older adults, … the risk of treatment causing a side effect or harm is greater…. Mr. V. has a very long list of medications. He has side effects…..medication optimization is a constant thing I'm always thinking about.

In addition to the potential risks associated with individual medications, older patients with COPD face the potential of adverse effects from the combined treatment of multiple diseases and risk factors. Advancing age is associated with an increased burden of comorbid conditions.[69] Guideline-directed care of Mr. V's COPD together with treatments necessary for his diabetes, hypertension, coronary artery disease, heart failure, and depression resulted in a complicated treatment plan involving multiple medications (polypharmacy).[70] Polypharmacy increases the likelihood of non-adherence,[71] adverse drug events,[72] falls,[68] and weight loss.[73] Prioritizing the treatment goals of older persons can help to tailor their treatment regimens. This requires a process of shared decision-making wherin patients identify the health outcome(s) of greatest importance to them. Older do have the ability to prioritize amongst the outcomes of extending length of life, maintaining function, and improving symptoms.[74] For the majority of patients who value maintaining function over life extension, medications with the greatest effect on promoting current function should be prioritized over those medications aimed at mortality reduction and/or which provide distant benefits, such as medications for primary or secondary prevention. Moreover, medications that are not recommended by guidelines because of an unfavorable benefit-to-harm ratio for the "average" patient may be reasonable treatment choices for patients whose treatment goals lead to a different weighting of benefits and harms. An example of one such medication is oral corticosteroids. For the patient whose most important treatment goal is relief of symptoms and whose symptoms respond to oral steroids, this benefit can outweigh the medication's short- and long- term adverse effects.

Communication, Prognostication, and Advance Care Planning

> Dr G: I think he recognizes that his condition is incurable and advanced…. The tricky thing about COPD is that it does get worse and then gets better….

Older persons with advanced COPD are at high risk for mortality. Among a 5-center US study of persons defined as having advanced COPD on the basis of hypercapnia at the time

of hospital admission, the in-hospital mortality rate was 11%, with a 1-year mortality rate of 43%.[75] A review of palliative and end-of-life care for patients with COPD summarizes several studies demonstrating that only a minority of patients with COPD have discussed their treatment preferences and end-of-life care issues with their physicians.[76] Patients with COPD vary in the amount and type of prognostic information they wish to receive;[76,77] therefore, this communication needs to be tailored to the information preferences of individual patients. Advance care planning can occur regardless of patients' desire for prognostic information by framing the conversation in terms of "preparing for the worst but hoping for the best".[76] Guidance exists in the literature regarding on how to approach end-of-life discussions.[78,79] Advance care planning includes early identification by patients of surrogate decision makers and, discussions between patients and their surrogates about patient goals, values, and preferences (see Box 2).

BOX 2

"Words to Say" in Communicating with Patients with Advanced COPD about Prognosis, Goals, and Advance Care Planning

Topic	Questions
Understanding of Illness	What do you think will happen to you as a result of your COPD in the future? What are your biggest hopes? What are your greatest fears?
Symptoms and goals of care	What are the most distressing symptoms you are having? Treatments to make one thing feel better can have side effects that make other things worse. When thinking about your breathing, mobility, energy, clarity of thinking, and mood, which is most important to you and why?
Desire for prognostic information	How much do you want to know about your prognosis?[104]
Advance care planning	Do you have someone you trust to make medical decisions for you if you cannot make them for yourself? Think about the last time your COPD got so bad that you had trouble breathing. If you were in this situation again, what would you hope for? What would you be most worried about? Did this situation make you think of ways of being that would be so unacceptable that you would consider them worse than death? Some patients say that if they became so sick that they could not recognize or talk to their loved ones (for example, if they had dementia or were in a coma), they would still want all possible treatments to prolong their life. Other patients say they would rather have care focused on comfort. Which kind of person are you? When you have your next COPD flare, if it is very severe and you needed to be hospitalized or intubated again to get through it, would you want that? Would you agree to be hospitalized again? To be intubated again?

Advance care planning is particularly challenging in COPD because of its prognostic uncertainty. Using models with good overall calibration and discrimination in a multicenter study of adults hospitalized with serious illness, patients with lung cancer had 6-month survival estimates approaching 0% on the day before death. In contrast, patients with COPD had median 6-month survival estimates of 40% or greater on 5 of the last 7 days of life. Whereas only 38% of patients with lung cancer who received mechanical ventilation survived to hospital discharge, the rate was 76% of patients with COPD.[34] Because of this uncertainty, it may not be realistic to have as the goal of advance care planning making definitive treatment decisions in advance of illness exacerbations. While some patients, like Mr. V, will be ready to make decisions such as forgoing CPR, others may not. For these patients, the goal should be preparing patients (if they are able) and/or their surrogates to make the best possible real-time decisions based on the details of the patient's clinical scenario.[80] The use of the "therapeutic trial" may be particularly useful in the face of

prognostic certainty.[81] Because patients' preferences are strongly determined by the functional and cognitive outcomes of care,[82] it is important for clinicians to understand patients' attitudes toward these outcomes, or, in other words, their goals of care. This allows a process of re-evaluating therapy as prognosis becomes more certain over time, with a plan to withdraw life-sustaining treatment if it will not meet patients' goals. These goals should be re-assessed if patients survive, in the context of patients' experiences of interventions.[83] Among older persons with COPD who were hospitalized within the prior 2 years in one study, 16% would not want to be re-admitted for a similarly severe exacerbation in the future.[84]

Conclusions

Mr V recovered from his COPD exacerbation by treating his underlying respiratory pathology. Unfortunately, he is returning to a fundamentally compromised state of health. His physical functioning will require reevaluation. Mr. V's history of multiple COPD exacerbations predict further declines in his health, although his precise prognosis is not known. He will need ongoing clear and explicit communication with his clinicians to prioritize his current and future care goals and to plan for his future medical care despite medical uncertainty.

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Table 1

Diagnostic considerations regarding respiratory failure in Mr V

Contributing factor		**Diagnostic Approach** [a]
Acute Hypercapneic Respiratory Failure	Reduced ventilatory capacity due to: • COPD exacerbation • Heart failure exacerbation • Medication-related effects • Respiratory muscle weakness • Osteoporosis-related kyphoscoliosis • Pulmonary thromboembolism • Advanced age	• COPD exacerbation:[b] arterial blood gas, pulse oximetry, chest radiograph, sputum gram stain and culture • Heart failure exacerbation: ECG, BNP, cardiac biomarkers, echocardiography • Consider adverse effects of medications: especially opiates and benzodiazepines • Forced vital capacity, MIP, fluoroscopic "sniff" test [c] • D-dimer and spiral (helical) chest CT [d]
Chronic Hypoxemic Respiratory Failure	Reduced ventilatory capacity due to: • Severe COPD • Heart Failure • Medication-related effects • Respiratory muscle weakness • Osteoporosis-related kyphoscoliosis • Pulmonary hypertension • Advanced age	• Chest radiograph, arterial blood gas, pulse oximetry [e] • PFT: spirometry, static lung volumes, DL_{CO} [f] • BNP, echocardiography • Consider adverse effects of medications: opiates, benzodiazepines, statins, and corticosteroids • Forced vital capacity, MIP, fluoroscopic "sniff" test [s] • Ventilation-perfusion lung scanning, right heart catheterization, and pulmonary angiography [g]

Abbreviations: BNP, brain natriuretic peptide; COPD, chronic obstructive pulmonary disease; CT, computed tomography; ECG, electrocardiography; HF, heart failure; MIP, maximal inspiratory pressure; PFT, pulmonary function test.

[a] Prioritization requires clinical judgment, including assessing the response to empiric therapy (e.g. bronchodilators versus diuresis) and patient-centered goals of care. The listed strategies are not exhaustive, emphasizing instead the main diagnostic elements.

[b] Defined as an acute change in a patient's baseline dyspnoea, cough and/or sputum beyond day-to-day variability and sufficient to warrant a change in therapy.[28]

[c] These are considered if respiratory muscle weakness is clinically suspected (e.g. phrenic nerve injury)

[d] If the clinical probability is low, a negative D-dimer precludes the need for a spiral CT. Otherwise, a spiral CT is required.

[e] Serial oximetry (at rest, with exercise, and asleep) to assess the need for oxygen supplementation, and an arterial blood gas to assess respiratory acidosis, including the need for non-invasive or invasive ventilatory support.

[f] The PFT-based static lung volumes refer to total lung capacity, residual volume, and functional residual capacity, measured by gas dilution or body plethysmography. Spirometric interpretation must consider age-related changes.[6–10]

[g] These are considered if chronic thromboembolic pulmonary hypertension is a clinical concern.

Table 2

Diagnostic considerations regarding dyspnea in Mr V

Contributing Factor	Diagnostic Approach
Reduced ventilatory capacity: • Chronic obstructive pulmonary disease (COPD) • Heart Failure (HF) • Medication-related effects • Respiratory muscle weakness • Osteoporosis-related kyphoscoliosis • Pulmonary hypertension (thromboembolism) • Advanced age	• See Table 1
Increased ventilatory demand (reduced aerobic capacity): • Low cardiac output (e.g. COPD [cor pulmonale], HF) • Anemia • Sarcopenia (e.g. deconditioning, malnutrition, age) • Medication-related effects (e.g. myopathy)	• See Table 1 (i.e. COPD and HF) • Orthostatic vital signs • Gait and balance assessment • Review diet, and difficulties in mastication (dentition, dyspnea) and swallowing • Evaluate anemia, as defined by medical concerns • Consider adverse effects of medications: – Postural hypotension: anti- hypertensives, anti-depressants, anti-anxiety agents – Balance impairment: opioids, anti- depressants – Myopathy: statins, corticosteroids
Psychosocial factors: • Depression • Anxiety • Post-traumatic stress disorder • Pain • Social isolation	• Psychiatric and pain evaluation, and/or specialty referral • Social work/case management consultation for transportation, senior center/adult day programs, or to establish the need for home health aide or transfer to a facility with higher level of care
Environmental factors: • Allergens (clutter) • Second-hand smoke • Biomass fuels (wood-burning fireplace or stove) • Stairs (especially those without rails)	• Home evaluation, including assessment of safety and need for single-floor living, ramps, and stair glide

See footnotes to Table 1.

Table 3

Approach to conditions contributing to functional decline among patients with advanced COPD

Risk factor	COPD-specific mechanism	Screening	Treatment
Depression/anxiety	Worsened sensation of dyspnea Decreased treatment adherence Increased risk exacerbation/hospitalization Worsened physical function	PRIME-MD	Cognitive behavioral therapy Pulmonary rehabilitation Consider pharmacologic therapy (See Box)
Osteoporosis	Systemic inflammation Corticosteroid use Vitamin D deficiency	DEXA 25-OH vitamin D	Anti-resorptive therapy
Falls	Gait and balance impairment Muscle weakness Nutritional deficiencies	Ask about prior falls Observe patient getting out of chair and walking for balance/ gait difficulties	Targeted treatment of fall risk factors
Physical impairment	Decreased exercise capacity Upper extremity and lower extremity weakness	Six-minute walk test Short Physical Performance Battery	Pulmonary rehabilitation
Cognitive impairment	Systemic inflammation Vascular disease Hypoxia	Mini-Cog	For patients with hypoxemia: continuous oxygen therapy Pulmonary rehabilitation