Overview of COPD

Chronic obstructive pulmonary disease (COPD) is a common, preventable, and treatable disease characterized by persistent respiratory symptoms, including dyspnea, cough, and sputum production, as well as airflow limitation. The chronic airflow limitation characteristic of COPD is caused by airway and/or alveolar abnormalities, which are usually due to exposure to noxious particles or gases. Tobacco smoking remains the main risk factor for COPD, but other environmental exposures and air pollution may also contribute to the risk of developing COPD. Additional risk factors include genetics, aging, abnormal lung development, and airway hyper-reactivity.

Only heart disease and cancer carry a higher mortality rate than COPD. Great strides have been made in the treatment of heart disease and stroke, resulting in shrinking death rates over the past 30 years. But deaths from COPD, largely due to patients’ smoking history, have more than doubled. An estimated 12.7 million US adults have been diagnosed with COPD; however, studies suggest it is an under-diagnosed disease state, with up to 24 million US adults having evidence of compromised lung function.

COPD in Long-Term Care Setting

COPD is commonly diagnosed in or after middle age, and it progresses with time. Based on data pooled from 28 countries, an estimated 14% of the world’s population aged 65 years and older has COPD. Given that a majority of long-term care (LTC) residents are over age 65, it is not surprising to learn that 10% to 20% of LTC residents have COPD. In order to explore and better understand the challenges that COPD poses to LTC health care providers and administrators, the following key issues will be discussed: COPD diagnosis, management, delivery of medication, and economic burden.

LTC Perspective

Comprehensive national and international guidelines for the management of COPD are readily available for use in practice; however, data on the management of COPD from the trenches of LTC were lacking. This led researchers Zarowitz and O’Shea to conduct a retrospective analysis to determine the prevalence, clinical characteristics, and treatment of LTC residents with a diagnosis of COPD and/or emphysema. This study provides a compelling look into the challenges, limitations, and obstacles that are part of managing COPD in LTC settings.

The study was designed as an analysis based on a large repository of LTC residents with COPD, prescription claims, and Minimum Data Set (MDS) version 2.0 data from a 12-month period (October 1, 2009 to September 30, 2010). Outcome measures included medications, diagnoses, and selected parameters from the MDS version 2.0.

Prevalence

As determined by the study, a total of 27,806 LTC residents were identified as having a diagnosis of COPD, with a prevalence of 21.5%, which is slightly above the global estimates cited above.
Figure 1. Cognitive impairments are common among LTC residents with COPD.

Optimal disease management may be challenging in the cognitively impaired

Among residents with COPD:

- 62% have short-term memory problems
- 43% have moderately or severely impaired cognitive skills for daily decision-making
- 37% have Alzheimer’s or dementia

*Based on a 2012 retrospective analysis of claims from skilled nursing facilities.
†Data measured were from October 2009 to September 2010 and based on the MDS, a standardized assessment tool for nursing facilities that includes factors that identify cognitive impairments.

The majority of LTC residents diagnosed with COPD in this cohort were female (58%) and aged ≥75 years (64%).

Cognitive Impairment

As LTC health care providers are well aware, many LTC residents require help with activities of daily living, have underlying concomitant illnesses, and are physically and cognitively impaired. Zarowitz and O’Shea substantiated this claim in their research by identifying that moderate to severe cognitive impairment was common in this group of LTC residents, with 62% having short-term memory problems (Figure 1). Furthermore, 43.3% of patients had moderately or severely compromised daily decision-making skills. These results provide support that cognitively impaired residents with COPD are a special population that present unique challenges in the optimal management of COPD.

In order to obtain data on cognitive impairment, the researchers utilized MDS, a standardized primary screening and assessment tool, that specifies individual factors used to identify residents with cognitive impairment. The Cognitive Performance Scale (CPS) was used in the study to measure cognition calculated from 5 unique MDS factors (eg, short-term memory). Cognitive impairment was defined as a score of 3 to 6 on the CPS.

Comorbidities

In addition to cognitive impairment, other comorbidities can further augment the impact of COPD on a patient’s health and complicate the management of COPD. A significant number of residents observed in the study had concurrent diagnoses, including hypertension (58%), depression (50%), diabetes mellitus (39.8%), congestive heart failure (37.5%), and dementia other than Alzheimer’s disease (28%). The following common comorbidities may also be present in residents with COPD: cardiovascular disease, stroke, anxiety, anemia, and pneumonia.

Diagnosis

Guidelines Regarding Diagnosis

In addition to the overall burdens and treatment challenges of COPD as a disease state, LTC health care providers are faced with the difficulties of diagnosing the disease among LTC residents. Diagnosis of COPD is based on a clinical evaluation that includes a complete medical history, physical examination, and assessment of disease (eg, comorbidities) to provide a more comprehensive picture of disease status. Signs and symptoms of COPD include wheezing, breathlessness, chest tightness, chronic cough, sputum production, and fatigue. The goals of COPD assessment from a health care professional’s perspective are to formulate the overall trajectory of the disease, including the current level of severity, ongoing effect of the disease on a person’s health status, and expectations of the disease’s progression (eg, exacerbations). However, these goals are not always easy to achieve and diagnosis methods specific to this population may need to be applied.

Challenges of Diagnosing COPD in LTC

Although the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria outlines 4 stages of disease based on airflow limitation in patients with forced expiratory volume in 1 second/forced vital capacity (FEV1/FVC) < 0.70 (Table 1), GOLD also states that a diagnosis of COPD should be based on more than spirometry. An assessment of an individual resident should combine symptomatic presentation and exacerbation risk with the resident’s spirometric classification. The revised 2017 GOLD recommendations for patient assessment acknowledge the limitations of FEV1. As stated in GOLD, “The separation of airflow limitation from clinical parameters makes it clearer what is being evaluated and ranked. This will facilitate more precise treatment recommendations based on parameters that are driving the patient’s symptoms at any given time.”

Although GOLD states that spirometry testing remains a vital component of COPD assessment, some older adults may be unable to perform this test, owing to cognitive impairment, limitations to vigorous respiratory efforts, or sedation. It also “may be difficult for individuals with dementia to follow instructions adequately for successful...”

| Table 1. Classification of airflow limitation severity in COPD (based on post-bronchodilator FEV1) |
| In patients with FEV1/FVC < 0.70 |
| GOLD 1: Mild | FEV1 ≥ 80% predicted |
| GOLD 2: Moderate | 50% ≤ FEV1 < 80% predicted |
| GOLD 3: Severe | 30% ≤ FEV1 < 50% predicted |
| GOLD 4: Very Severe | FEV1 < 30% predicted |

GOLD = Global Initiative for Chronic Obstructive Lung Disease. GOLD does not endorse any specific treatments. Abbreviation: FEV1, forced expiratory volume in 1 second.
Spirometry testing.\(^9\) Given the pervasiveness of cognitive impairment in the LTC environment detailed by Zarowitz and O’Shea, combined with the challenges that cognitively impaired residents have completing necessary diagnostic testing, making a diagnosis of COPD in the LTC population is a highly difficult endeavor.\(^6\)

Researchers Stefaniacci and Kelleher suggest that diagnosis of COPD can be achieved by other means.\(^7\) For example, having the resident exhale as if they were blowing out birthday candles may help identify airway obstruction. If the health care provider listens for the expiratory wheeze characteristic of COPD. A resident with normal pulmonary function would not experience the same labored expiration as one with COPD.\(^7\)

**Management**

**Treatment Goals**

Because COPD can be characterized as being irreversible or partially reversible, complete resolution of symptoms and reversal of damage are not realistic treatment goals. Once COPD is diagnosed, goals of therapy include prevention of disease progression, relief of symptoms, improvement of exercise tolerance and health status, prevention and treatment of exacerbations and complications, and reduced mortality.\(^8,9\) In the LTC setting, it is recommended that clinicians develop an individualized care plan and define treatment goals, factoring in the patient’s comorbidities, prognosis, life expectancy, and preferences.\(^9,10\) GOLD and The Society for Post-Acute and Long-Term Care Medicine (AMDA) recommend a stepwise approach to therapy for the management of COPD. Management of stable COPD includes pharmacologic treatment and nonpharmacologic treatment (e.g., smoking cessation, exercise, nutritional support, and oxygen therapy for certain patients).\(^10,11\) A patient’s symptoms and their future risk of exacerbations should act as the foundation for pharmacologic management of stable COPD.\(^11\)

Although the AMDA guidelines outline steps for the recognition, assessment, treatment, and monitoring of COPD in the LTC setting, barriers exist in achieving these goals in this patient population (Table 2).\(^9\) Manifestations of COPD in older adults may vary, and COPD may be virtually indistinguishable from other chronic diseases prevalent in this patient population.\(^9\) Additionally, LTC clinicians may lack sufficient knowledge of appropriate screening tools and effective treatments for COPD.\(^9\)

The “ABCD” assessment tool provided by GOLD (Figure 2) can be used by clinicians to assess the impact of COPD on an individual patient, in terms of symptom burden and the risk of exacerbations, in order to guide therapy decisions. Both GOLD and AMDA support long-acting bronchodilators, including long-acting beta agonists (LABAs), as a standard of care for COPD maintenance.\(^9\)

According to the treatment algorithm proposed by GOLD (Figure 2), patients that are categorized in Group A using the assessment tool should be offered bronchodilator treatment due to its effects on breathlessness. In the case of Group A, this can either be a short- or long-acting bronchodilator.\(^9\) With patients categorized under Group B or Group C, starting therapy should be a long-acting bronchodilator. For Group C patients with persistent exacerbations, a second long-acting bronchodilator or a LABA/long-acting muscarinic agent (LAMA) combination may provide a benefit.\(^9\) Patients categorized as Group D are recommended to start with a LABA/long-acting muscarinic agent (LAMA) combination.\(^9\)

**Under treatment in LTC**

Despite the available treatment guidelines, the Zarowitz and O’Shea study showed that COPD is undertreated in the LTC setting. Among...
residents with COPD, 22% experienced at least 2 exacerbations during the 12-month study, defined as an event in which a resident was provided treatment with a short course (≤14 days) of respiratory antibiotics, oral corticosteroids, or both.10 The majority of residents (as many as 60%) who experienced at least 2 exacerbations did not receive a long-acting agent, underscoring that long-acting bronchodilators may be underutilized in this patient population. Seventeen percent of residents did not receive any respiratory treatments at all, and 49% received a short-acting beta₂-agonist (SABA).8 Shortness of breath and exacerbations are common among LTC residents, particularly for cognitively impaired residents taking nebulized SABA monotherapy in the absence of LABAs or long-acting anticholinergic agents.8 These data highlight the importance of medication management in LTC residents with COPD.

Undertreatment of COPD was also demonstrated in a 1-year, retrospective analysis of 8507 Medicare patients (the study also included patients with commercial insurance).11 In the Medicare population, 70.9% received no long-term pharmacotherapy for COPD, including 66% of COPD patients with no prescribed COPD medication, and 4.9% prescribed SABAs only.11 Among a subset of Medicare patients classified as high-complexity (defined as having comorbid respiratory conditions and clinical interventions while participating in the study), the findings were similar: 68.8% of patients received no long-term pharmacotherapy for COPD (64% received no COPD medication and 4.8% received SABAs only).11

Delivery of Medication

COPD medication class, formulation, and route of administration vary among LTC residents. Selection of the appropriate inhalation therapy device is a particular challenge in this setting. The most commonly used devices to administer inhaled medications are metered-dose inhalers (MDIs), dry-powder inhalers (DPIs), and nebulizers.12 All have drawbacks, particularly in elderly patients. Administration errors increase with age and the severity of airflow obstruction.12 Elderly patients, particularly those aged ≥75 years, may have cognitive and physical difficulties that hinder device use, resulting in insufficient dosing and reduced quality of life.12

Returning to the Zarowitz and O’Shea analysis of COPD management, the study looked at residents receiving monotherapy with SABAs, LABAs, or the combination, in handheld devices versus nebulized medication, to determine the prevalence of shortness of breath.8 Of the cognitively impaired patients who received SABA monotherapy, shortness of breath was detected in 39.1% over the 12-month period (Figure 1).8 Nebulized SABA was the most frequently utilized COPD treatment in this cohort, but those receiving LABA monotherapy were less likely to have shortness of breath or an exacerbation (25% and 26.9%, respectively).8 It should be noted, however, that only 52 patients received LABA therapy compared with 4215 who received SABA monotherapy, making the population too small to draw conclusions.8

In a study by Taffet, Donohue, and Altman of cognitively impaired patients who were provided instruction on proper inhaler use, 50% with borderline cognitive impairment were not able to effectively operate an MDI.6 A meta-analysis of 24 studies found that 77% of patients made an error while using a pressurized MDI.13 Only 14% of patients aged ≥75 years adhered to the correct procedures and use of pressurized MDIs.13 Other limitations that adversely affect proper use of pressurized MDIs include inadequate hand-breath coordination, poor fine motor control, and physical conditions that cause hand or muscle weakness, including arthritis, stroke, and Parkinson’s disease.13 The DPI dose is typically loaded before each treatment inhalation, usually with a powder- filled capsule.14 One of the most difficult aspects of DPI use among elderly patients is opening the

BY THE NUMBERS

Undertreatment of COPD in LTC is a major concern. The findings of the Zarowitz and O’Shea study revealed the following:

- 22% of residents with COPD experienced at least 2 exacerbations during the 12-month study (defined as an event in which a resident received either a short course [≤14 days] of respiratory antibiotics, oral corticosteroids, or both)
- As many as 60% of residents who experienced at least 2 exacerbations did not receive a long-acting agent
- 17% of residents did not receive any respiratory treatments at all
- 49% of residents received a nebulized SABA

---

Figure 3. Pharmacological treatment algorithms by GOLD grade (highlighted boxes and arrows indicate preferred treatment pathways)6

- Preferred treatment =
- According to GOLD is patients with a major discrepancy between the perceived level of symptoms and severity of airflow limitation, further evaluation is warranted.
- GOLD = Global Initiative for Chronic Obstructive Lung Disease
- GOLD does not endorse any specific treatments.
- © 2017 Global Strategy for Diagnosis, Management and Prevention of COPD all rights reserved. Use is by express license from the owner.

GOLD = Global Initiative for Chronic Obstructive Lung Disease.

Adapted from 2017 GOLD.

... continued...
Nebulizer drawbacks include preparation and cleaning of the device and lengthy treatment time. The added burden to LTC staff must also be considered when assessing more complicated methods of administration. Nebulizers are commonly used in LTC facilities; the 3 main types are jet nebulizer, ultrasonic nebulizer, and vibrating mesh nebulizer. Nebulizer therapy has a treatment time that, depending on product, can range from 5 to 20 minutes, providing medication delivery to the lungs with regular tidal breathing.

Nebulizer drawbacks include preparation and cleaning of the device and lengthy treatment time. Although nebulizers would require someone to set up the device and help administer medication, researchers Ondr, Delouich, Chipp, and colleagues outlined several clinical scenarios in which certain populations with COPD may be appropriate for maintenance nebulized therapy:

- Patients with cognitive impairments that impede the use of handheld devices
- Patients with an inability to perform tasks with their hands as a result of symptoms stemming from arthritis, Parkinson’s disease, or stroke-related disability
- Patients undergoing a high level of pain or declining muscle strength resulting from neuromuscular disease
- Patients who are unable to use MDIs or DPIs, or who have a preference for nebulizers regardless of the correct utilization of MDIs or DPIs
- Patients with limited treatment success despite education and training
- Patients with limited treatment success regardless of the correct utilization of MDIs or DPIs, or who have a preference for nebulizers

Nebulization offers:

- 2% of COPD patients receive nebulized LABA, lincting anticholinergics, or combination LABA/ICS to reduce shortness of breath and the worsening of COPD symptoms.

### Economic Burden

In addition to being a leading cause of morbidity and mortality, COPD represents a substantial and rising cost burden because of exacerbations and the high rate of hospitalizations and emergency department use. Incidents of hospitalization in the older population are often caused by COPD, with approximately 65% of COPD discharges in 2010 attributed to persons aged ≥65 years. Using data from the 2006–2010 Medical Expenditure Panel Survey, the 2004 National Nursing Home Survey, and 2010 CHS data, researchers Ford, Murphy, and colleagues projected the economic impact of COPD. The findings showed that national costs were expected to swell by 53%, from $32.1 billion in 2010 to $49.0 billion in 2020. Overall, 51% of total national medical costs for COPD were paid by Medicare, 25% by Medicaid, and 18% by private insurance.

Health care expenditures associated with COPD and comorbidities impose a substantial financial burden. To assess the impact of comorbidities on COPD-associated costs, researchers Mamine, Higuchi, Yu, and colleagues conducted a retrospective observational study using data from a large administrative claims database. Among the cohort of 183,681 patients with COPD, the 4 most common comorbidities were cardiovascular disease (34.8%), diabetes (22.8%), asthma (17.4%), and anemia (14.2%). More than half of the patients (52.8%) had at least 1 noteworthy comorbidity. The average all-cause total health care costs from the index date to 360 days after the index date were highest among patients with chronic kidney disease and anemia ($41,288 and $38,870, respectively). Total health care costs were highest for patients with COPD and anemia ($10,762 more, on average, than a patient with COPD without anemia). Despite the growing population of residents in LTC facilities in the United States, there is limited research examining the clinical and economic outcomes for Medicare beneficiaries in LTC settings. This led researchers Simoni-Wastila, Blanchette, Qian, and colleagues to conduct a retrospective cohort study of 3037 patients aged ≥60 years with a diagnosis of COPD. As a person with COPD progresses in age, his or her risk for all-cause hospitalization increases. LTC expenditures represent 76.2% of COPD-related and 68.4% of all-cause direct medical costs. COPD-related and all-cause direct expenditures per beneficiary, which occurred over the course of a year, were $7,391 and $48,183, respectively. In COPD-related and all-cause estimates, LTC costs were the greatest contributors ($5,629 and $32,966, respectively), followed by pharmacy costs ($956 and $5,565, respectively).

Evidence-based analyses have been used to evaluate the economic burden of COPD, including hospitalization; however, cost estimates vary. There is no doubt that COPD has a major impact on hospital readmissions. In fact, it is the third most common condition associated with potentially avoidable hospital readmissions among dual-eligible beneficiaries (1179 hospital stays per 100,000 enrollees) in 2008, with an average cost per hospital stay of $7,949. Researchers Dalal, Shah, O’Souza, and Rane reported on the components of hospital care in 2008 as they relate to COPD costs in a Medicare population. Using administrative data from 602 hospitals, the
researchers found that COPD-related costs were $7,544 for a simple inpatient admission; however, the cost significantly increased to $45,607 per hospitalization for COPD exacerbations requiring intensive care unit admission and intubation.

Unlike other chronic conditions, hospitalization rates for COPD have not declined in recent years, according to data from the Nationwide Inpatient Sample and Nationwide Emergency Department Sample. The average number of hospital discharges per year for COPD patients was 100,000 higher from 2008 to 2012 than from 2001 to 2007.

In 2015, COPD was added to the CMS Hospital Readmissions Reduction Program. The all-cause 30-day readmission rate for COPD and bronchiectasis is approximately 20%. CMS proposes to reduce Medicare payments for skilled nursing facilities that fail to meet standards for readmission rates. As of October 1, 2017, skilled nursing facilities will be required to publicly report readmission rates according to mandates from the Protecting Access to Medicare Act of 2014. The US Department of Health and Human Services will then develop a performance standard that includes details of achievement and improvement, followed by the establishment of a scoring method and ranking system. Starting on October 1, 2018, Medicare reimbursement rates will be partially tied to these performance scores, with the highest ranking skilled nursing facilities receiving the highest reimbursement and the lowest ranking receiving the lowest incentive payments.

Cost of treatment is also a factor among older adults with COPD. A recent study by researchers Ejzykowicz, Bollu, Rajagopalan, and Hay examined the discrepancies between inpatient resource use and total health care costs from a national sample of Medicare beneficiaries with COPD who initiated treatment with LABA or SABA medications (n=3017). SABA-treated patients were much more likely to have used oral corticosteroids and to have a greater number of hospitalizations compared to LABA-treated patients, according to the unadjusted comparison that occurred during the 6-month follow-up period of the study. LABA-treated patients incurred significantly lower average medical costs and lower average total health care costs from all causes compared with SABA-treated patients. Ejzykowicz, Bollu, Rajagopalan, and Hay note, "Given that Medicare spending is projected to

\[\text{Figure 5. Comparison of health service utilization patterns between patients with COPD on SABA vs LABA treatment at 6-month follow-up after the initial observation period (6 months)}^{15}\]

\[\text{S A B A  t r e a t e d} \quad \text{L A B A  t r e a t e d}\]

\[\begin{array}{cccc}
\text{Spirometry} & 0.0\% & 0.0\% & P<.01 \\
\text{OCS use} & 15\% & 14\% & P=.02 \\
\text{Specialist visit} & 3\% & 6\% & P<.001 \\
\text{Physician visit} & 65\% & 65\% & P=.002 \\
\text{ED visit} & 8\% & 7\% & P=33 \\
\text{Hospitalization} & 23\% & 16\% & P<.001 \\
\end{array}\]

\[\text{KEY CHALLENGES OF COPD IN THE LTC POPULATION}\]

- LTC residents may lack the mental capacity and/or physical skills required to undergo several diagnostic tests and treatment options for COPD, presenting challenges for proper diagnosis and treatment of the disease in this patient population.

- There is a need for better adherence to and awareness of the COPD treatment guidelines—specifically the guidance warranting the use of LABAs for the LTC population.

- There is a startling economic burden of treating COPD in this population. Rehospitalization is chief among the contributors to COPD care costs and is a persistent obstacle to maintaining a reasonable cost of care.
grow from $512 billion in 2014 to $858 billion in 2024, the implications of improved chronic disease management for conditions such as COPD, which ranks among the most costly to the Medicare system, are substantial.

Conclusion
In its own right, COPD is a formidable disease state with no known cure. When COPD presents in the LTC population, the challenges of treatment and management increase substantially. Age is a risk factor for COPD, and given the age of most LTC residents (>65 years old), the increased prevalence in this community compared to the general population is understandable. Age also brings comorbidities such as cognitive impairment, which can complicate treatment. Residents of LTC facilities with COPD present unique challenges in the optimal management of their disease, and LTC health care providers must continue their commitment to the best strategies of care.

References