Chronic Obstructive Pulmonary Disease (COPD)

Presenter: Dr. Milta Little
Disclosure Statement: I have nothing to disclose.

Objectives: By the end of the session, participants will be able to…

- List and describe the age-related changes in respiratory, physical, and cognitive function that affect the diagnosis and medication management of COPD in NH residents
- List the benefits and drawbacks of the various drug classes and administration routes of COPD medications
- Identify potential drug-drug interactions of COPD medications with other commonly used agents

Expected Outcomes (Desired change in practice):

- Optimize drug therapies for the maintenance of COPD and the management of exacerbations
- Follow an algorithmic approach to COPD management in the NH
- Reduce acute care transfers for COPD exacerbation

Article for Review: **Pleasants RA, Radlowski PA, and Davidson HE. Optimizing Drug Therapies in Patients with COPD in the Nursing Home Setting. Drugs and Aging 2019; 36:733-745**

Outline for Rapid Fire session

1. Case: COPD

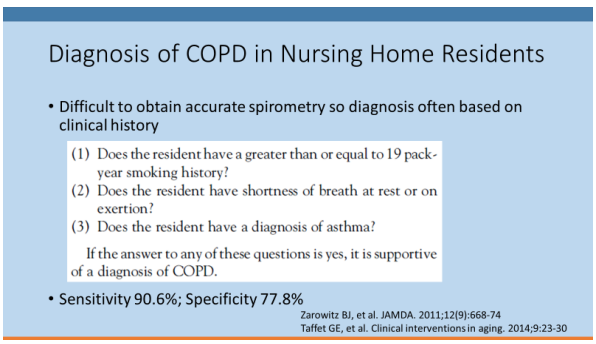
JF is an 80-year-old female who you are asked to see for acute onset shortness of breath. Symptoms began approximately 2 days before and had progressively worsened with no associated, aggravating, or relieving factors noted. She had similar symptoms approximately 1 year ago with an acute, chronic obstructive pulmonary disease (COPD) exacerbation requiring hospitalization. She denies fever, chills, cough, wheezing, sputum production, chest pain, palpitations, pressure, abdominal pain, abdominal distension, nausea, vomiting, and diarrhea.

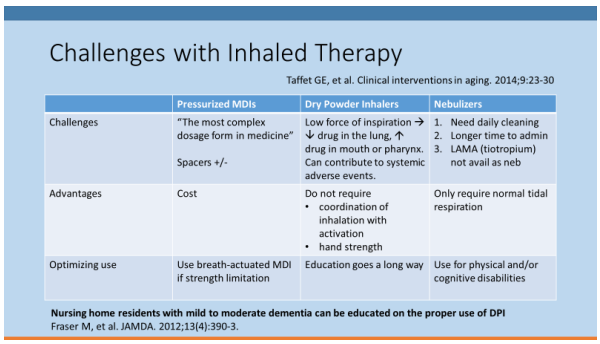
She reports difficulty breathing at rest, forgetfulness, mild fatigue, feeling chilled, requiring blankets, increased urinary frequency, incontinence, and swelling in her bilateral lower extremities that are new-onset and worsening. Subsequently, she has not ambulated from bed for several days except to use the restroom due to feeling weak, fatigued, and short of breath.

Past medical history is significant for coronary artery disease, myocardial infarction, COPD, hypertension, hyperlipidemia, hypothyroidism, diabetes mellitus, peripheral vascular disease, tobacco usage, MCI, and obesity.

Her current medications include fluticasone-vilanterol 100-25 mcg inhaled daily, hydralazine 50 mg by mouth, 3 times per day, hydrochlorothiazide 25 mg by mouth daily, albuterol-ipratropium inhaled every 4 hours PRN, levothyroxine 175 mcg by mouth daily, metformin 500 mg by mouth twice per day, nebivolol 5 mg by mouth daily, aspirin 81 mg by mouth daily, vitamin D3 1000 units by mouth daily, clopidogrel 75 mg by mouth daily, isosorbide mononitrate 60 mg by mouth daily, and rosuvastatin 40 mg by mouth daily.
VS: temperature 97.3 F, heart rate 74 bpm, respiratory rate 24, BP 104/54, HT 160 cm, WT 100 kg, BMI 39.1, and O2 saturation 90% on room air. **What are your next steps in management?**

2. Epidemiology of COPD in the NH
    a. 20% of NH residents have ≥2 exacerbations in 12-month period
    b. COPD hospitalizations and ED visits
        i. Rate 6.2-22.5%
        ii. High 30-day readmission rate (up to 20%)
        iii. Claims data report of residents with COPD: 43% at least one hospitalization; 90% at least one ED visit in 12-month period
3. Factors that affect inhaler use in NH residents
    a. Age-related changes
        i. Reduced inspiratory effort
        ii. Loss of fast-twitch fibers lead to diaphragm fatigue
    b. Physical changes
        i. Reduced chest wall compliance, respiratory muscle strength, peak inspiratory and expiratory airflow, vital capacity, gas exchange
        ii. Osteoporosis and kyphosis change chest wall mechanics
        iii. ADL limitations, especially ambulation, affect use of common scales to assess symptoms and COPD severity
        iv. Sarcopenia – reduced hand grip strength is an independent predictor of improper pMDI use
        v. Sarcopenia can affect the diaphragm also
    c. Cognitive changes
        i. Impairment associated with improper pMDI and DPI use
        ii. Dementia leads to inability to perform spirometry properly
        iii. MMSE score <23/30 unlikely to properly self-administer pMDI





4. Optimizing medication management for COPD maintenance therapy

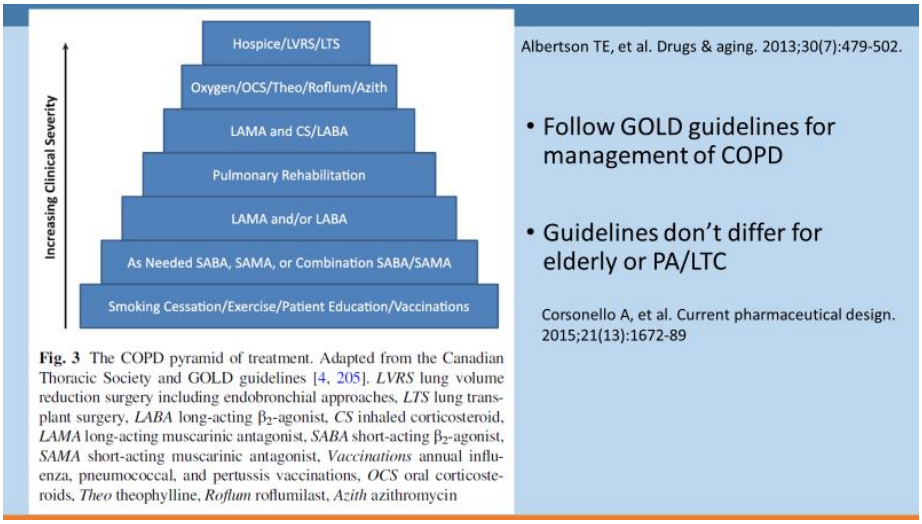


Fig. 3 The COPD pyramid of treatment. Adapted from the Canadian Thoracic Society and GOLD guidelines [4, 205]. *LVRS* lung volume reduction surgery including endobronchial approaches, *LTS* lung transplant surgery, *LABA* long-acting β_2-agonist, *CS* inhaled corticosteroid, *LAMA* long-acting muscarinic antagonist, *SABA* short-acting β_2-agonist, *SAMA* short-acting muscarinic antagonist, *Vaccinations* annual influenza, pneumococcal, and pertussis vaccinations, *OCS* oral corticosteroids, *Theo* theophylline, *Roflum* roflumilast, *Azith* azithromycin

a. MDI – use valved holding chambers or soft mist inhaler
b. DPI – ensure adequate peak inspiratory effort
c. Nebulizers – may be only option for some residents, especially with significant physical or cognitive impairments. All drug classes are now available in nebulizer form

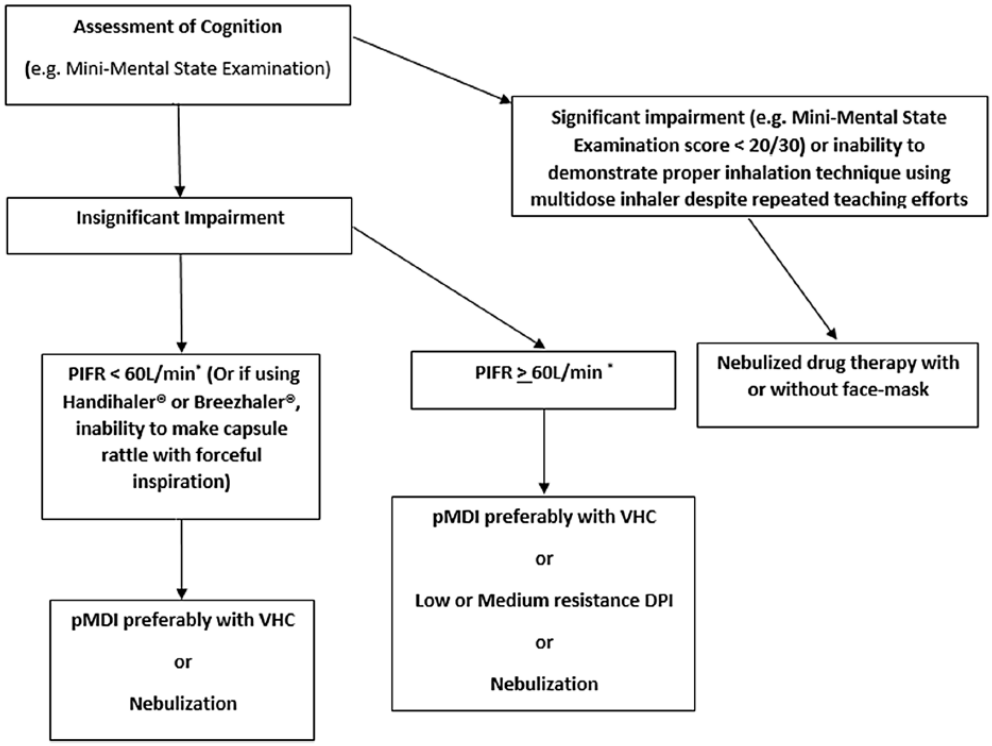


Fig. 2 Algorithm for selecting inhalational drug therapy devices for patients with chronic obstructive pulmonary disorder in the nursing home setting (assuming administration assisted by healthcare provider). *Testing peak inspiratory rate ideally should be performed when a patient's respiratory status is clinically stable when determining maintenance medications. *DPI* dry powder inhaler, *PIFR* peak inspiratory flow rate, *pMDI* pressurized metered dose inhaler, *VHC* valved holding chamber (e.g., spacer)

Table 2 Inhaled maintenance medications for chronic obstructive pulmonary disorder (COPD)

Drug class	Drug name	Route(s)	Onset/duration	Side effects in the elderly
Short-acting β2-agonists[a]	Albuterol, Levalbuterol	pMDI, DPI Nebulization	Onset: < 5 min Duration: 4–8 h (shorter during exacerbation)	Tachycardia Tremors Hypokalemia Unclear whether β2-agonists increase risk of CV events
Long-acting β2-agonists	Formoterol, Indacaterol, Olodaterol, Salmeterol, Vilanterol	pMDI, DPI	Onset: within 15 min for all agents except salmeterol (slower onset) Duration: formoterol and salmeterol, 12 h Indacterol, olodaterol, and vilanterol, 24 h	
Long-acting β2-agonists	Arformoterol, Formoterol	Nebulization	Onset: within 5 min Duration: 12 h	
Short-acting antimuscarinic[a]	Ipratropium	pMDI Nebulization	Onset: within 30 min Duration: 6–8 h	Urinary retention Dry mouth Blurred vision Unclear whether inhaled anti-muscarinics increase risk of CV events
Long-acting antimuscarinics	Aclidinium, Glycopyrrolate, Tiotropium, Umeclidinium	pMDI, DPI	Onset: within 30 minutes Duration: Aclidinium, glycopyrrolate (in USA), 12 h. Tiotropium and umeclidinium, 24 h	
	Glycopyrrolate, Revefenacin	Nebulization	Onset: within 30 min Duration: glycopyrrolate, 12 h, revefenacin, 24 h	
Short-acting β2-agonist/short-acting antimuscarinic[a]	Albuterol/ipratropium	SMI Nebulization	Onset: < 5 min for β2-agonist, 30 min for anti-muscarinic Duration: 4–8 h (shorter during exacerbation)	
Inhaled corticosteroids[b]	Beclomethasone, Budesonide, Fluticasone propionate, Fluticasone fumarate, Mometasone	pMDI, DPI	Onset: anti-inflammatory effects typically days, up-regulation of β2-receptors, onset within 24 h Duration: typically dosed every 12–24 h	Oral and esophageal candidiasis Dysphonia Increased risk of pneumonia Increased risk of osteoporosis
	Budesonide	Nebulization		

CV cardiovascular, *DPI* dry powder inhaler, *h* hours, *min* minutes, *pMDI* pressurized metered dose inhaler, *SMI* soft mist inhaler

[a]Although short-acting β2-agonists and antimuscarinics are normally for acute therapy (e.g., rescue), if administered multiple times daily, they could serve as maintenance therapy

[b]None approved as monotherapy for COPD

5. Optimizing medication management for treatment of COPD exacerbations
    a. Aggressive short-acting nebulized bronchodilators
    b. Corticosteroids
        i. Usually systemic, <2 week course
        ii. High-dose nebulized budesonide 2-4 mg Q 8-12 h as alternate in people with high risk hyperglycemic, heart failure, delirium
        iii. Frequent use should prompt concurrent osteoporosis treatment

6. Important drug-drug and drug-disease interactions
    a. Heart failure – concurrent in >20%
        i. often due to pulmonary HTN and right-sided heart failure
        ii. beta-blockers can be used safely in people with COPD
            1. Do NOT increase risk of exacerbation of lung function decline
            2. DO reduce risk of mortality

b. Diabetes – systemic steroids, fluoroquinolones
c. Safety concerns
    i. Bronchodilators – low risk of CV side effects
    ii. Dual-acting bronchodilators (LABA/LAMA) preferred over ICS-containing regimen in high risk of pneumonia
    iii. Oral drug therapies used infrequently due to systemic s/e
d. Other pharmacologic agents (Table 3)

Table 3 Pharmacodynamic interactions with inhaled chronic obstructive pulmonary disorder medications

Drug	Interacting agents	Pharmacological effects
β2-agonists	Thiazide and loop diuretics	Enhanced hypokalemia
β2-agonists	Corticosteroids	Additive tachycardia, tremors, hypokalemia
β2-agonists	Non-selective or high-dose selective B-blockers	Antagonizing β2-agonist effects
Anti-muscarinics	Systemic anticholinergics	Additive anticholinergic effects as dry mouth, urinary retention
Inhaled corticosteroids	Systemic corticosteroids	Additive systemic corticosteroid effects