More Than Just Breathing: Evaluating Inhaler Use in Older Adults

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Meet The Speaker

Amanda Lovell is a Clinical Pharmacist for Optum Hospice Pharmacy Services. She graduated with her Doctorate in Pharmacy from Ohio Northern University. She completed a PGY1 Pharmacy Residency at Florida Hospital-Celebration Health and a PGY2 Pain Management and Palliative Care Residency through Optum and Ohio State University. She is a Board Certified Geriatric Pharmacist. Dr. Lovell serves on the Research Committee and Education Committees for the Society of Pain and Palliative Care Pharmacists (SPPCP) and is an APPE and PGY2 Residency preceptor. She is a member of ASCP, the National Hospice and Palliative Care Organization and SPPCP.
Disclosure

• I have no relevant financial relationships with manufacturers of any commercial products and/or providers of commercial services discussed in this presentation.
• This discussion will include the use of medications for off-label indications.

Pharmacist Learning Objectives
1. Articulate appropriate inhaler use for older adults
2. Define barriers to appropriate and effective inhaler use
3. Discuss potential for ineffective control of symptoms and adverse events associated with inhaler misuse

Pharmacy Technician Learning Objectives
1. Describe appropriate inhaler use for senior patients
2. Recognize barriers to appropriate and effective inhaler use
3. List potential negative outcomes associated with inhaler misuse in older adults
COPD Prevalence

- Globally, prevalence of COPD is estimated to be 11.7%
  - Around 3 million deaths annually
- Over 10% of the US population age ≥ 75 reports having COPD
- 2012 study found that 21.5% of nursing home residents had a diagnosis of COPD

COPD Risk Factors

- Cigarette smoking
- Environmental factors
- Genetic Factors
- Age
- Gender (female)
- Socioeconomic status

GOLD, 2020; Taffet, 2014; Zarowitz, 2012
Patient Case

- Paul is a 74-year-old male with a diagnosis of COPD
  - PMH: hypertension and depression
- Paul has been complaining of worsening dyspnea with minimal exertion

Current Medications:
- Advair 250/50 1 inhalation BID
- Albuterol 0.083% 1 unit dose q3h PRN wheezing/dyspnea
- DuoNeb 1 unit dose nebulization QID PRN
- Lisinopril 20 mg PO once daily
- Oxygen 2L/min via nasal cannula PRN
- ProAir 2 puffs q4h PRN shortness of breath
- Sertraline 50mg po daily
- Spiriva HandiHaler 18 mcg once daily

Types of Inhalers
### Medication Classes

<table>
<thead>
<tr>
<th>Class</th>
<th>Mechanism</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-2 Agonists</td>
<td>Act on β-2 receptors in the lung to dilate the airways</td>
<td>Short-Acting (SABA): albuterol, levalbuterol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long-Acting (LABA): formoterol, salmeterol, vilanterol</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Block action of acetylcholine in the lungs to dilate the airways</td>
<td>Short-Acting: ipratropium</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Inhibit inflammation and mucous secretion; enhance β-adrenergic responses to dilate the airways</td>
<td>Inhaled: fluticasone, budesonide, beclomethasone</td>
</tr>
</tbody>
</table>

Pharmacist Letter, 2019; Optum, 2019

### Available Inhaler Devices

- MDI with Spacer
- MDI
- Diskus
- HandiHaler
- TwistHaler
- AutoHaler
- Aerolizer
- FlexHaler
- NesHaler
- RespinMat
- Pressair
- TurbuHaler
- Ellipta

[Available Inhaler Devices](https://use-inhalers.com/)

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10/28/20
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- FlexHaler
- NeSra
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Available Inhaler Devices

https://use-inhalers.com/

Phones Help: 1-888-USE-INHALER

2020 Annual Meeting & Exhibition
November 12-15, 2020 | Kissimmee, Florida

Metered-Dose Inhalers

1. Follow instructions to prepare specific metered-dose inhaler (MDI)/soft mist inhaler (SMI) device for use
2. Shake inhaler, if appropriate, and hold properly
3. Position for open airway inhalation
4. Exhale slowly and completely
5. Close mouth around device mouthpiece, do not block vents
6. Activate inhaler device timed to start of inspiration
7. Slowly and deeply inhale medication over about 5 seconds
8. Hold breath for 10 seconds to allow medication to deposit into airway
9. Wait 1 minute; repeat steps 2-8 if more than 1 inhalation is ordered
10. If inhaled medication contains a corticosteroid, rinse mouth with water, gargle, and spit out water

Pharmacist Letter, 2017
Dry-Powder Inhalers

1. Follow instructions to prepare specific dry-powdered inhaler (DPI) device for use
2. Turn head away from device to exhale slowly and completely
3. Close mouth around mouthpiece, do not block vents
4. Inhale forcefully, steadily, and deeply to propel medicated powder into lungs
5. Hold breath for 10 seconds to allow medication to deposit into airway
6. Remove DPI from mouth and exhale slowly
7. Repeat steps 1-6 if more than 1 inhalation is prescribed
8. If inhaled medication contains a corticosteroid, rinse mouth with water, gargle, and spit out water

Pharmacist Letter, 2017

Self-Assessment Question #1

Which of the following is true about dry-powder inhalers?

A. Most new inhaler products are not dry-powder inhalers
B. In order for the medication to have optimal effects, patients must inhale forcefully, steadily and deeply to deliver medication into lungs
C. Dry-powder inhalers are only for maintenance of respiratory diseases
D. There are low rates of error with the use of dry-powder inhalers
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Data on Inhaler Use
Effect of Incorrect Use of DPI on Management of Patients with Asthma and COPD

• Systematic Literature Review
• Objective: assess the incidence of incorrect inhaler technique with DPIs in patients with asthma and COPD, to highlight most common errors and discuss implications for clinical efficacy
• 47 articles identified on incorrect use of DPIs
• Products included in studies:
  • Diskhaler®, Cyclohaler®, Rotahaler®, Turbuhaler®, Diskus®, Accuhaler®
• Percentage of patients with incorrect inhalation technique ranged from 0 to 94% in adults

Lavorini, 2008

Effect of Incorrect Use of DPI on Management of Patients with Asthma and COPD

• Errors included:
  • Incorrect dose metering (1-46%)
  • Incorrect inhaler positioning (0-44%)
  • No exhalation before activation (most common error 12-77%)
  • Incorrect mouthpiece positioning (0-35%)
  • No forceful and deep inhalation (0-48%)
  • No breath hold (0-73%)
  • Failure to breathe out slowly (2-43%)

Lavorini, 2008
Dry-Powder Inhalers: Which Factors Determine the Frequency of Handling Errors

- Observational Study
- 224 outpatients were asked to demonstrate inhaler technique
- Inhaler-specific error rates
  - Aerolizer® 9.1%
  - Diskus® 26.7%
  - HandiHaler® 53.1%
  - Turbuhaler® 34.9%
- Error rates increased with age and severity of airway obstruction
  - With Turbuhaler® estimate risk of error was 9.8% in an 18-year old with normal lung function and previous training
  - Risk was 83.2% in an 80-year old with moderate or severe obstruction who had not received training

Wieshammer, 2008

Device Errors in Asthma and COPD: Systematic Literature Review and Meta-Analysis

- Systematic Review (72 studies) and Meta-Analysis (40 studies)
- Objective: to provide an estimate of error rates by device type and to evaluate the factors associated with inhaler misuse
- 50-100% of patients experience at least one error
  - Overall error frequency of 86.8% for MDIs
  - Overall error frequency of 60.9% for DPIs
  - Most common errors: no exhalation before inhalation, not holding breath after inhalation, not using a proper seal around mouthpiece

Chrystyn, 2016
Device Errors in Asthma and COPD: Systematic Literature Review and Meta-Analysis

• Inconsistency between studies of the definition of a critical error
  • Most studies defined critical error rate as “the proportion of patients with an error for a step that is deemed necessary for adequate delivery of the drug to the lungs”

• Critical errors can impact the effectiveness of the delivered drug and lead to sub-optimal control of disease/symptoms

• 14-92% of patients experienced at least one critical error
  • Critical error frequency for MDIs: 45.6%
  • Critical error rate for DPIs were highly variable for each device
    • Poled rate estimated a frequency of 28.4%

Chrystyn, 2016

Inhalation Technique Errors with MDI Among Patients with Obstructive Lung Disease

• Systematic Review and Meta-Analysis

• Objective: quantify the prevalence of inhalation technique errors among U.S. adults with COPD who use MDIs and determine which device steps were most problematic for MDIs

• 10 articles met inclusion for meta-analysis

• 86.7% of patients made at least 1 inhalation technique error

• 76.8% of patients incorrectly performed at least 20% of device steps

Cho-Reyes, 2019
Inhalation Technique Errors with MDI Among Patients with Obstructive Lung Disease

- Slightly higher proportion of patients who used a spacer made inhalation technique errors (82.7%) vs. those without a spacer (78.2%)
- Most frequent errors:
  - Failure to attach the inhaler to the spacer when required (78.1%)
  - Failure to exhale fully (65.5%)
  - Failing to hold breath for 5-10 seconds (41.9%)
  - Inhaling too fast and not deeply (34.9%)
  - Failing to shake inhaler before use (34.2%)

Cho-Reyes, 2019

Parameters Affecting Inhalation Therapy Adherence in Elderly Patients

- Cross-sectional study of patients over age 65 with diagnosis of asthma or COPD
- Objective: assess the parameters affecting inhalation techniques and treatment adherence in elderly patients
- 90.2% of patients made at least one mistake when using their inhaler device
- Patients with cognitive impairment had significantly higher number of admissions to ER because of asthma/COPD in the past year
- Patients with cognitive impairment, low socioeconomic status, high number of admissions to ER in the past year, and presence of dyspnea/sputum had lower inhalation device scores

Turan, 2016
Determinants of Poor Inhaler Technique

- Older age
- Use of multiple devices
- Lack of previous education on inhaler technique
  - Lack of placebo devices is a limitation and barrier to providing quality inhaler technique instruction

State Operations Manual- F760

- “The facility must ensure that its— §483.45(f)(2) Residents are free of any significant medication errors.”
- Metered-Dose Inhalers (MDI)
  - Ensuring that a device is administered correctly is vital to optimizing inhalation therapy
  - Surveyors may observe administration of MDIs
  - Isolated failure to administer because of patient condition should not be cited as medication error
  - If repeatedly fail to administer device because of patient condition, it would be cited as medication error
Self-Assessment Question #2

Paul is a 74-year-old male who uses a ProAir HFA inhaler. Which of the following inhaler technique errors would be common for an older adult like Paul?

A. Failing to hold breath after inhalation
B. Failing to exhale prior to using inhaler device
C. Not shaking MDI prior to use
D. All of the above
Evaluating Inhaler Use

When To Evaluate Patient’s Inhaler Use

- Change in patient status
  - Decline in mental status
  - Recent hospitalization for COPD exacerbation or dyspnea
  - Decline in functional status
  - Worsening visual impairment
- Increased use of PRN medications
- Prior to refilling prescriptions
- Experiencing side effects after use of inhaler
How To Evaluate Inhaler Use

• Create a checklist for each inhaler type to assist in evaluation
  • National Asthma Council Australia
    • https://www.nps.org.au/assets/319a355375e97608-1a10de79a43a-Inhaler-device-checklists.pdf
  • Review package inserts for guidance on proper use of each specific device
  • National Heart, Lung and Blood Institute Asthma Tip Sheets

• Provide patients information on proper inhaler use
  • Centers for Disease Control and Prevention Inhaler Videos
    • https://www.cdc.gov/asthma/inhaler_video/default.htm

Patient Case

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Sample Checklists

**Advair Diskus®**
- Opens device and clicks mouthpiece into place
- Holds Diskus in a flat level position
- Slides lever away from mouthpiece
- Exhales completely while continuing to hold Diskus flat
- Puts mouthpiece to lips
- Breathes in quickly and deeply through mouth only
- Removes device from mouth and holds breath for 10 seconds
- Breathes out slowly
- Closes device
- Rinses mouth with water

**Spiriva® HandiHaler®**
- Opens device to reveal mouthpiece
- Removes mouthpiece so center chamber is showing
- Opens Spiriva blister pack and puts capsule into the center chamber
- Closes mouthpiece firmly until device clicks
- Holds device with mouthpiece pointed up and pierces button once until it is flat against the base
- Breathes out completely in one breath
- Holds head in an upright position
- Breathes in deeply until lungs are full
- Holds breath for a few seconds and takes device out of mouth
- Breathes out completely a second time
- Breathes in deeply again until lungs are full
- Holds breath for a few seconds and takes device out of mouth
- Opens mouthpiece and discards the Spiriva capsule into trash

Dr. Advair Diskus, 2019; Spiriva HandiHaler, 2018

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Sample Checklist

**ProAir™ HFA**
- Shakes inhaler well before use
- Removes the cap from the mouthpiece and checks for foreign objects
- Breathes out fully through the mouth
- Places mouthpiece into mouth and holds inhaler in the upright position
- Closes lips around mouthpiece with tongue placed below mouthpiece
- While breathing in deeply and slowing through the mouth, fully depresses the metal canister
- Holds breath as long as possible for up to 10 seconds
- Removes mouthpiece from mouth and breathes out
- Repeats as necessary if prescribed additional puffs

ProAir, 2005
Additional Assessment Questions

- Is the patient using SABA multiple times a day in addition to the LABA?
- Are there duplications of therapy with the inhaler regimen?
- Is the patient experiencing any adverse reactions from the medications?
- Does the patient perceive benefit from the medication?
  - Can patient still accomplish reasonable functional goals?

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Self-Assessment Question #3

What concerns do you have about Paul’s medication regimen?

A. Potential for adverse effects with overuse of albuterol
B. Duplication of therapy with Advair and Spiriva
C. Multiple inhaler types could contribute to inhaler use errors
D. Both A and C
How to Manage Inhaler Errors

Education and Training

- When appropriate, use the “teach-back” approach when providing inhaler education
- If placebo devices are unavailable, encourage patient to use their own device when teaching inhaler technique
- Re-check inhaler technique frequently to reinforce proper use
- Evaluate inhaler technique, using a checklist, before concluding that current therapy is insufficient or a treatment failure
Alternatives to Inhalers

• No evidence for superiority of nebulized therapy over hand-held devices in patients who are able to use devices properly
• Perceptions and Attitudes Toward the Use of Nebulized Therapy for COPD: Patient and Caregiver Perspectives
  • Survey of patients receiving nebulized therapy as well as their caregivers
  • 80% of patients and caregivers reported that using a nebulizer was better than only using an inhaler
  • 75% of patients believed that their overall quality of life had improved since beginning nebulization

GOLD, 2020; Sharafkhaneh, 2013

Alternatives to Inhalers

• Nebulizer Advantages:
  • Confidence in medication administration due to visible mist
  • Less steps for use/no special technique
  • Ability to mix more than one medication in a nebulizer
• Nebulizer Disadvantages:
  • More time consuming than MDI or DPI
  • Require equipment maintenance and cleaning for infection control
  • Less portable than inhalers

Geller, 2005
Nebulizers and COVID-19

- What does the literature say?
  - In a March 2020 letter to the editor in *CMAJ*, pulmonologists proposed that because nebulizers create aerosolized droplets, the nebulization process would facilitate transport of bacteria and virus into the lungs during patient use.
  - A 2012 review article on aerosol-generating procedure concluded that there was no significant risk of transmission related to nebulizers, utilizing evidence from the SARS outbreak.
  - Current UK guidance on infection prevention for COVID-19 does not list nebulizers as a potential transmission risk, due to the fact that the aerosol generated by the device is derived from the medication fluid within the nebulizer chamber and not the patient.

Amirav I, 2020; Tran, 2012; Gov.UK, 2020

- What guidance is there?
  - American College of Allergy, Asthma and Immunology (ACAAI):
    - Nebulized treatments should be administered in a location that minimizes exposure to close contacts who do not have COVID-19.
    - Choose a location where air is not recirculated or areas where surfaces can be cleaned easily.
  - ASHP Guidance:
    - In settings where clinicians deliver nebulized medications, consider switching to MDI or DPI in patients who can perform steps to properly use inhalers.
  - WHO Guidance:
    - Insufficient evidence to classify nebulizer therapy as aerosol-generating procedure associated with COVID-19 transmission and further study is needed.

ASHP, 2020; ACAAI, 2020
Self-Assessment Question #4

Which of the following is true about medications administered via a nebulizer?

A. Nebulized medications have been shown to be more effective than inhalers in patients able to use inhalers properly
B. Nebulizers are less time consuming than inhalers
C. A survey of patients showed improved quality of life when switching to nebulized medications
D. The GOLD guidelines recommend only using nebulized medications in older adults
Key Points

• Evaluating inhaler use helps to determine patient compliance
• Patient’s may need frequent education on proper inhaler use
• Assess patient response to medications and consider alternative routes of medication delivery if symptoms are uncontrolled

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References

- COPD Pocket Toolkit. Optum Hospice Pharmacy Services, LLC. 2019. For more information contact druginformation@hospiscript.com.