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BOOT CAMP

Respiratory Disorders in the Older Adult

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Meet the Speaker

Kacey West, PharmD, BCACP, BCGP, is an Ambulatory Care Clinical Pharmacist and an Associate Professor of Pharmacy Practice at Butler University College of Pharmacy and Health Sciences. She received her Doctor of Pharmacy from Butler University. She went on to complete a PGY-1 residency at Community Health Network in Indianapolis and a PGY-2 residency in geriatrics and academia at Midwestern University College of Pharmacy-Glendale in Glendale, AZ. Her interests include geriatrics, chronic disease state management, and academia. She currently works within a Family Medicine clinic providing interdisciplinary care as well as providing disease state management through a collaborative practice agreement.

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Disclosure

- Kacey West does not have relevant financial relationships with ineligible companies.
- None of the planners for this activity have relevant financial relationships to disclose with ineligible companies.

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Learning Objectives

1. Assess respiratory clinical findings and functional status of older adults to determine clinical status
2. Develop appropriate therapeutic treatment options for chronic obstructive pulmonary disease, asthma, allergic rhinitis and other respiratory disorders in the older adult
3. Assess respiratory medication regimens for medication related problems and potentially inappropriate medications
4. Apply respiratory therapy recommendations and person-specific goals to older adult patient cases

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Age-Related Respiratory Changes

- Decreased vital capacity (VC)
- Decreased lung elasticity
- Increased residual volume
- Decreased forced expiratory volume (FEV1)

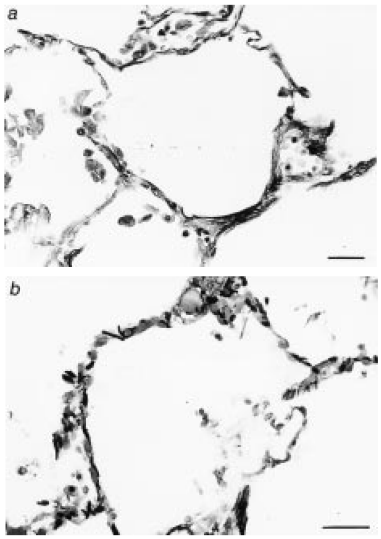

Fig. 5. – Detail of alveolar wall in a) a 29-yr-old subject, showing fine elongated elastic fibres in the alveolar walls and in b) a 100-yr-old subject, showing fragmented rarefied elastic fibres in septae. (Elastin stain; internal scale bar = 35 µm (a); 45 µm (b).)

Clinical Interventions in Aging 2013:8 1489–1496
Eur Respir J 1999; 13: 197-205.

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Age-Related Respiratory Changes

- Decrease size of thoracic cavity
  - Limiting vital capacity and altering the muscles
- Muscle function less efficient and has decreased reserve
- Cough strength reduced
  - Clearance of particles from the lung decreased
- Changes in immunity, increase susceptibility to infections

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Clinical Interventions in Aging 2013:8 1489–1496

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Chronic Obstructive Pulmonary Disease (COPD)

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COPD in Older Adults

- Symptoms
  - Dyspnea – persistent and progressive
  - Chronic cough
  - Changes in sputum characteristics and production
- Key assessment components
  - Symptom characteristics and magnitude
  - History of moderate/severe exacerbations (and future risk)
  - Spirometry
  - Comorbidities
- Primary cause – tobacco smoking
  - Other environmental factors
    - Air pollution
    - Biomass fuel exposures
    - Occupational hazards (dust)
  - Patient factors
    - Genetic abnormalities/predisposition
    - Abnormal lung development
    - Accelerated aging

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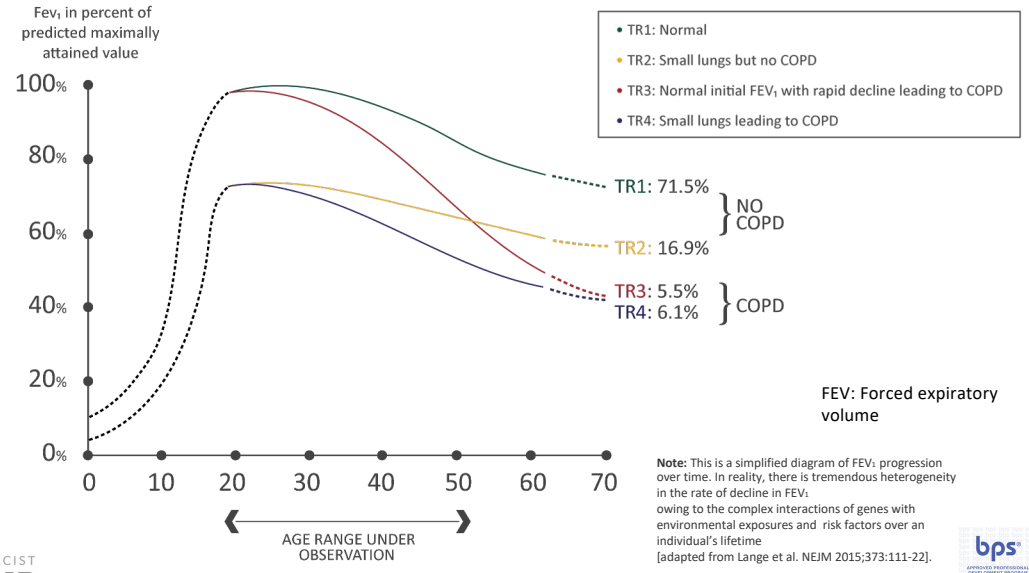
FEV_1 PROGRESSION OVER TIME



FEV: Forced expiratory volume

Note: This is a simplified diagram of FEV₁ progression over time. In reality, there is tremendous heterogeneity in the rate of decline in FEV₁ owing to the complex interactions of genes with environmental exposures and risk factors over an individual's lifetime [adapted from Lange et al. NEJM 2015;373:111-22].

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COPD – Diagnosis

- Spirometry needed for a diagnosis: Post BronchodilatorFEV1/FVC < 0.70
  - Severity of airflow obstruction no longer used to assess exacerbation risk

Gold 1	Mild	$FEV_1 \geq 80\%$ predicted
Gold 2	Moderate	$50\% \leq FEV_1 < 80\%$
Gold 3	Severe	$30\% \leq FEV_1 < 50\%$
Gold 4	Very Severe	$FEV_1 < 30\%$

FVC: Forced vital capacity

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Modified British Medical Research Council (mMRC) dyspnea scale

Category	Symptoms
mMRC Grade 0	Breathless with strenuous exercise
mMRC Grade 1	Short of breath when hurrying on level ground or walking up slight incline
mMRC Grade 2	Walk slower than people of same age on level ground due to breathlessness or must stop for breath when walking at own pace on level ground
mMRC Grade 3	Stop for breath after walking 100 meters or after a few minutes on level ground
mMRC Grade 4	Too breathless to leave house or breathless when dressing/undressing

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BMJ 1960;2:1662

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• COPD Assessment Test ™ (CAT™)

- 8 item dimensional measure of health status impairment in COPD
- Score ranges from 0 to 40 with higher scores indicating increased impairment

CAT™ ASSESSMENT

For each item below, place a mark (x) in the box that best describes you currently. Be sure to only select one response for each question.

EXAMPLE: I am very happy	0	X	2	3	4	5	I am very sad
I never cough	0	1	2	3	4	5	I cough all the time
I have no phlegm (mucus) in my chest at all	0	1	2	3	4	5	My chest is completely full of phlegm (mucus)
My chest does not feel tight at all	0	1	2	3	4	5	My chest feels very tight
When I walk up a hill or one flight of stairs I am not breathless	0	1	2	3	4	5	When I walk up a hill or one flight of stairs I am very breathless
I am not limited doing any activities at home	0	1	2	3	4	5	I am very limited doing activities at home
I am confident leaving my home despite my lung condition	0	1	2	3	4	5	I am not at all confident leaving my home because of my lung condition
I sleep soundly	0	1	2	3	4	5	I don't sleep soundly because of my lung condition
I have lots of energy	0	1	2	3	4	5	I have no energy at all

SCORE

TOTAL SCORE:

Reference: Jones et al. ERJ 2009; 34 (3); 648-54.
FIGURE 2.3

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CAT vs mMRC

- Different evaluation of symptoms when using CAT vs mMRC
  - Can lead to different classification
- mMRC is easier/quicker to use
- CAT scores more sensitive than mMRC
  - May depend on disease and severity of illness

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J Formos Med Assoc. 2019;118:429-435.

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COPD – Pharmacotherapy (Inhalers)

Short-Acting Beta Agonists (SABA)
- Albuterol
- Levalbuterol

Short-Acting Muscarinic Antagonists (SAMA)
- Ipratropium

Inhaled Corticosteroids (ICS)
- Fluticasone
- Mometasone
- Budesonide
- Beclomethasone

Long-Acting Beta-Agonists (LABA)
- Arformoterol
- Formoterol
- Indacterol
- Olodaterol
- Salmeterol
- Vilanterol

Long-Acting Muscarinic Antagonists (LAMA)
- Tiotropium
- Aclidinium
- Glycopyrrolate
- Umeclidinium
- Revefenacin

Product availability and information- see table in handout (adapted from GOLD 2025)

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Inhaler Treatment – Adverse Drug Reactions

Inhaled beta$_2$-adrenergic agonists

- resting sinus tachycardia, cardiac rhythm disturbances in susceptible patients, tremor in older adults

Inhaled antimuscarinics

- dry mouth, dry eyes

Inhaled corticosteroids

- oral candidiasis, hoarse voice, skin bruising, increased risk pneumonia, enhance osteoporosis (bone fractures)

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GOLD ABE Assessment Tool

Figure 2.3

Spirometrically confirmed diagnosis → Assessment of airflow obstruction → Assessment of symptoms/risk of exacerbations

Post-bronchodilator FEV1/FVC < 0.7

GRADE	FEV1 (% predicted)
GOLD 1	≥ 80
GOLD 2	50-79
GOLD 3	30-49
GOLD 4	< 30

EXACERBATION HISTORY	SYMPTOMS: mMRC 0-1 CAT < 10	SYMPTOMS: mMRC ≥ 2 CAT ≥ 10
≥ 2 moderate exacerbations or ≥ 1 leading to hospitalization	E	
0 or 1 moderate exacerbations (not leading to hospitalization)	A	B

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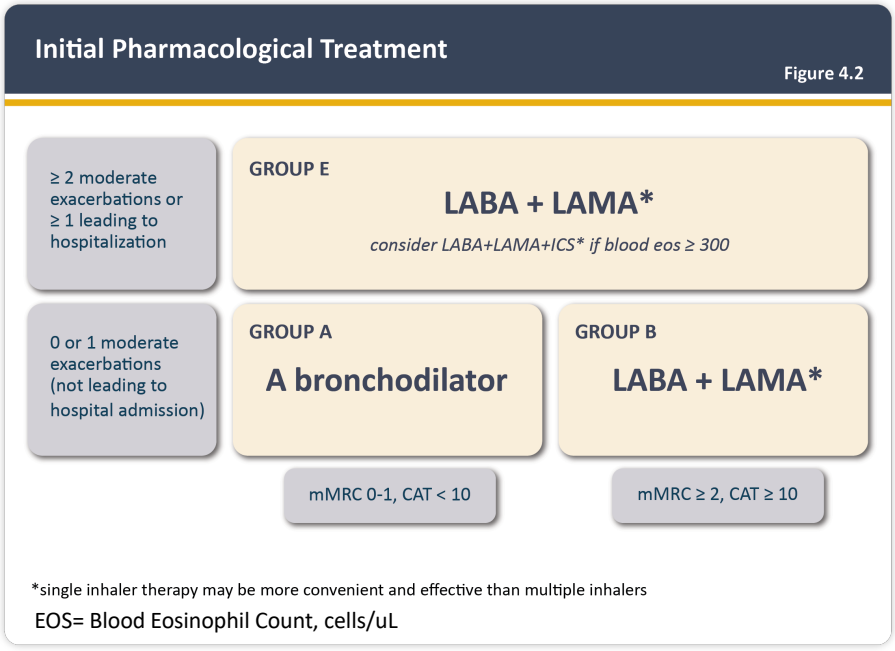

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How to Choose a Bronchodilator

- Regular and PRN use of SABA or SAMA improves FEV1 and symptoms: recommend for all patients
  - Combined SABA and SAMA superior to either alone, but consider if patient should be on long-acting agent
- LABA and LAMA improve lung function, dyspnea, health status, and reduce exacerbations
  - Combined LABA and LAMA improves FEV1 and reduces symptoms better than monotherapy; combo also shown to reduce exacerbations

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Table 3. Comparison of LABA/LAMA with monotherapy, LABA/ICS or triple therapy.

LABA/LAMA versus	Lung Function	Dyspnea	Exacerbations	Exercise Tolerance	Health/Functional Status/Quality of Life	Pneumonia
LAMA	Rogliani Int J Chron Obstruct Pulmon Dis 2018 SR [37]	Rogliani Int J Chron Obstruct Pulmon Dis 2018 SR [37]	Rogliani Int J Chron Obstruct Pulmon Dis 2018 SR [37]	Rogliani Int J Chron Obstruct Pulmon Dis 2018 SR [37]	Rogliani Int J Chron Obstruct Pulmon Dis 2018 SR [37]	Rodrigo Int J Chron Obstruct Pulmon Dis 2017 SR/MA [38]
	Calzetta Eur Respir Rev 2017 MA [39]	Calzetta Eur Respir Rev 2017 MA [39]	Calverley Lancet Respir Med 2018 RCT [40]	Calzetta Respir Med 2017 MA [41]	Calzetta Eur Respir Rev 2017 MA [39]	Oba Cochrane Library 2018 SR/MA [34]
	Aziz Int J Chron Obstruct Pulmon Dis 2018 SR/MA [42]	Mahler Eur Respir J 2014 RCT [43]	Ichinose Int J Chron Obstruct Pulmon Dis 2018 RCT [44]	O'Donnell Eur Respir J 2017 PRCT [45]	Ferguson NPJ Prim Care Respir Med 2017 PRCT [46]	
	Mahler Eur Respir J 2014 RCT [43]	Ferguson NPJ Prim Care Respir Med 2017 PRCT [46]	Wedzicha Adv Ther 2020 PRCT [47]	Minakata Int J Chron Obstruct Pulmon Dis 2019 PRCT [48]	Martinez Int J Chron Obstruct Pulmon Dis 2019 PRCT [49]	
	Martinez Int J Chron Obstruct Pulmon Dis 2019 PRCT [49]	Martinez Int J Chron Obstruct Pulmon Dis 2019 PRCT [49]	Chen Ther Adv Respir Dis 2020 SR/MA [35]	Ichinose Int J Chron Obstruct Pulmon Dis 2018 RCT [50]	Price Int J Chron Obstruct Pulmon Dis 2017 SR [51]	
	Price Int J Chron Obstruct Pulmon Dis 2017 SR [51]	Price Int J Chron Obstruct Pulmon Dis 2017 SR [51]	Mammen et al. Ann Am Thorac Soc 2020 a SR/MA [36]	Maltais Adv Ther 2021 MA/PRCT [52]	Buhl Eur Respir J 2015 PRCT [53]	
	Buhl Eur Respir J 2015 PRCT [53]	O'Donnell Eur Respir J 2017 PRCT [45]		Takahashi Int J Chron Obstruct Pulmon Dis 2020 RCT [54]	Singh Respir Med 2015 PRCT [55]	
	Singh Respir Med 2015 PRCT [55]	Miravitlles Respir Res 2017 SR/MA [56]			Labor Respiration 2018 SR [57]	
	Beeh Pulm Pharmacol Ther 2015 RCT [58]	Rodrigo Int J Chron Obstruct Pulmon Dis 2017 SR/MA [38]			Miravitlles Respir Res 2017 SR/MA [56]	
	Maltais Adv Ther 2019 RCT [59]	Takahashi Int J Chron Obstruct Pulmon Dis 2020 RCT [54]			Rodrigo Int J Chron Obstruct Pulmon Dis 2017 SR/MA [38]	
	Miravitlles Respir Res 2017 SR/MA [56]	Calzetta Chest 2016 SR/MA [60]			Calzetta Chest 2016 SR/MA [60]	
	Rodrigo Int J Chron Obstruct Pulmon Dis 2017 SR/MA [38]	Mammen et al. Ann Am Thorac Soc 2020 a SR/MA [36]			Mammen et al. Ann Am Thorac Soc 2020 a SR/MA [36]	
	Calzetta Chest 2016 SR/MA [60]	Maltais Eur Respir J 2019 RCT [61]				
	O'Donnell Eur Resp J 2017 PRCT [45]					

Color code: LABA/LAMA superior ; LABA/LAMA equal ; LABA/LAMA inferior . Although the prespecified crude analysis produced a rate ratio of 0.93 (p-value > 0.01, not significant) comparing LABA/LAMA to LAMA alone, a sensitivity analysis adjusted for the baseline rate of exacerbations and other factors produced a rate ratio of 0.89 (p-value 0.001, significant). CR, Cochrane review; ICS, inhaled corticosteroid; LABA, long-acting β_2-agonist; LAMA, long-acting muscarinic antagonist; MA, meta-analysis; PRCT, pooled or post hoc analysis of randomized clinical trials; RCT, randomized clinical trial; RWS, real-world study; SR, systematic review.

Table 3. *Cont.*

LABA/LAMA versus	Lung Function	Dyspnea	Exacerbations	Exercise Tolerance	Health/Functional Status/Quality of Life	Pneumonia
	Miravitlles Respir Res 2017 SR/MA [56]		Suissa Chest 2019 RWS [63]			
	Rodrigo Int J Chron Obstruct Pulmon Dis 2017 SR/MA [38]					
Triple therapy	Cazzola Eur Respir J 2018 SR/MA [66]	Koarai Respir Res 2021 SR/MA [67]	Cazzola Eur Respir J 2018 SR/MA [66]		Koarai Respir Res 2021 SR/MA [67]	Mammen Annals ATS 2020 b SR/MA [68]
	Koarai Respir Res 2021 SR/MA [67]	Mammen Annals ATS 2020 b SR/MA [68]	Koarai Respir Res 2021 SR/MA [67]		Koarai Respir Investig 2022 SR/MA [69]	Zheng The BMJ 2018 SR/MA [70]
	Koarai Respir Investig 2022 SR/MA [69]		Cabrera Ann Epidemiol 2022 RWS [71]		Zheng The BMJ 2018 SR/MA [70]	Quint Expert Rev Respir Med 2022 RWS [72]
	Zheng The BMJ 2018 SR/MA [70]		Quint Expert Rev Respir Med 2022 RWS [72]			Koarai Respir Res 2021 SR/MA [67]
			Suissa Chest 2020 RWS [73]			Suissa Chest 2020 RWS [73]
			Koarai Respir Investig 2022 SR/MA [69]			Cazzola Eur Respir J 2018 SR/MA [66]
			Lee PLOS Med 2019 SR/MA [74]			Koarai Respir Investig 2022 SR/MA [69]
			Mammen Annals ATS 2020 b SR/MA [68]			Lee PLOS Med 2019 SR/MA [74]
			Zheng The BMJ 2018 SR/MA [70]			

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Monotherapy: when and how to use?

- Data for initial management is lacking
- LAMAs have greater effect on reducing exacerbation than LABAs
  - In a trial of early-stage COPD, demonstrated a decrease in moderate exacerbations but not severe exacerbations
- No effect on lung function decline
- Improves symptoms and decreases hospitalizations
- Tiotropium improves pulmonary rehab and exercise performance

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N Engl J Med 2017; 377:923-935
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Use of Corticosteroids

Benefits

- ICS + LABA more effective than either alone to improve function and reduce exacerbation in moderate to very severe COPD
- ICS/LAMA/LABA triple therapy better than dual or monotherapy in severe disease

Risks

- ICS alone does not modify long-term decline of FEV1 or mortality in COPD
- ICS use increases infection risk, including pneumonia risk, esp. in severe disease
- Long-term oral steroids have high risk with no evidence of benefits

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Clinical Case – COPD

AM is a 72-year-old residing at home. She has a history of heart failure, hypertension, and hypothyroidism.

She was recently presented to urgent care and was diagnosed with a new COPD exacerbation.

Her medication list includes:

- Furosemide 20 mg po daily
- Levothyroxine 88 mcg po daily
- Carvedilol 12.5 mg po BID
- Lisinopril 40 mg po daily
- Atorvastatin 40 mg po daily
- Guaifenesin + dextromethorphan 5 ml po QID PRN

Use of noninhalers for COPD

Some data supports use

- Phosphodiesterase (PDE) 4 Inhibitors
  - Roflumilast
- PDE 3 and 4 Inhibitors
  - Ensifentirine- standard jet nebulizer
- Antibiotics
  - Azithromycin 500 mg three times a week or 250mg daily
  - More beneficial in patients who have quit smoking

Lack data for chronic use

- Oral glucocorticoids
- Mucolytics
- Monoclonal antibodies

COPD Treatment – Adverse Drug Reactions

Phosphodiesterase-4 inhibitors – roflumilast

- Nausea, anorexia, weight loss, diarrhea, sleep disturbance, headache – occur early in treatment often causing discontinuation in trials – will diminish over time

Macrolides - azithromycin

- Bacterial resistance, impaired hearing tests, QTc prolongation

Methylxanthines – theophylline

- Nausea, anorexia, diarrhea, restlessness, tremor, insomnia, headache, dizziness, restlessness, nervousness
- Many drug interactions; reduced clearance in older adults
- Narrow therapeutic index – seizures and dysrhythmias at toxic levels

PDE 3 and 4 Inhibitors-ensifentirine

- Back pain, high blood pressure, bladder infection, diarrhea, suicidal thoughts and behavior

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Self-Assessment Question #1

AM's physical activity is limited to shopping at the grocery store, which has become quite a struggle for her. She stops and catches her breath every few minutes. Based on this information and other information provided, how would you classify her mMRC score?

A. Grade 1
B. Grade 2
C. Grade 3
D. Grade 4

Modified British Medical Research Council (mMRC) dyspnea scale

Category	Symptoms
mMRC Grade 0	Breathless with strenuous exercise
mMRC Grade 1	Short of breath when hurrying on level ground or walking up slight incline
mMRC Grade 2	Walk slower than people of same age on level ground due to breathlessness or must stop for breath when walking at own pace on level ground
mMRC Grade 3	Stop for breath after walking 100 meters or after a few minutes on level ground
mMRC Grade 4	Too breathless to leave house or breathless when dressing/undressing

BMJ 1960;2:1662

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Self-Assessment Question #2

Based on information provided, which maintenance treatment would be most appropriate for AM?

A. Umeclidinium/vilanterol
B. Fluticasone
C. Formoterol/budesonide
D. Roflumilast

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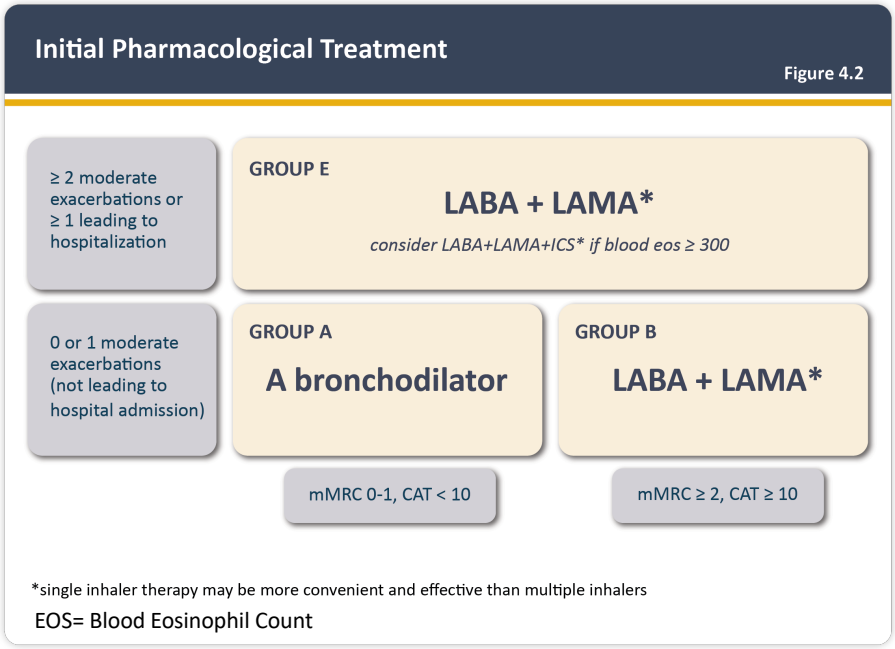

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COPD- Escalating Therapy

- No longer determined based on group
- Divided by dyspnea symptoms and exacerbations
  - Do not need to wait for an exacerbation to step up therapy
- Assess blood eosinophil count
  - Can help determine the efficacy of using an ICS
  - ICS have little to no effect if blood eosinophil count <100 cells/uL
  - ≥300 cells/uL show best relationship between eosinophil count and ICS benefit
  - Thresholds are estimates

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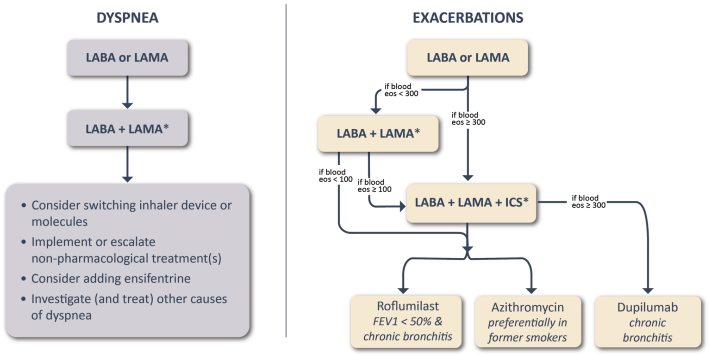
Follow-up Pharmacological Treatment

Figure 3.9



*Single inhaler therapy may be more convenient and effective than multiple inhalers; single inhalers improve adherence to treatment.
Consider de-escalation of ICS if pneumonia or other considerable side-effects. In case of blood eos ≥ 300 cells/µl de-escalation is more likely to be associated with the development of exacerbations.
Exacerbations refers to the number of exacerbations per year.

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COPD- De-escalating Therapy

- Progressive disease, de-escalating uncommon but not incorrect
- ICS withdrawal
  - Consider if patient has recurrent pneumonia, lack of appropriate indication, or lack of response
- WISDOM Trial
  - N=2485 patients with history of COPD exacerbation received triple therapy, then randomly assigned to continue or withdraw ICS in 3 steps over 12-week period
  - Primary endpoint: time to first moderate-severe COPD exacerbation

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N Engl J Med 2014;371:1285-1294.

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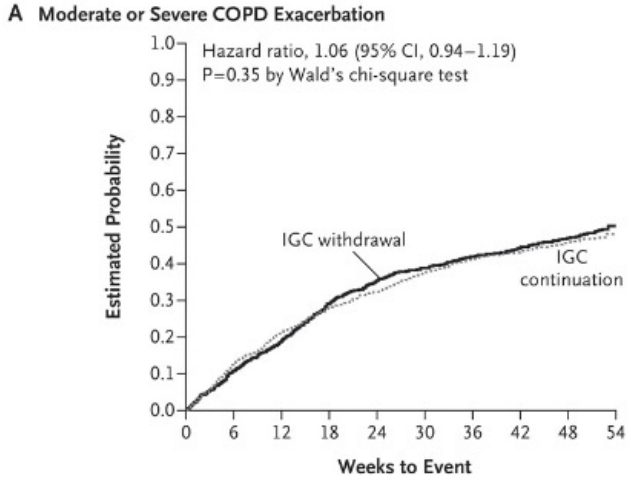
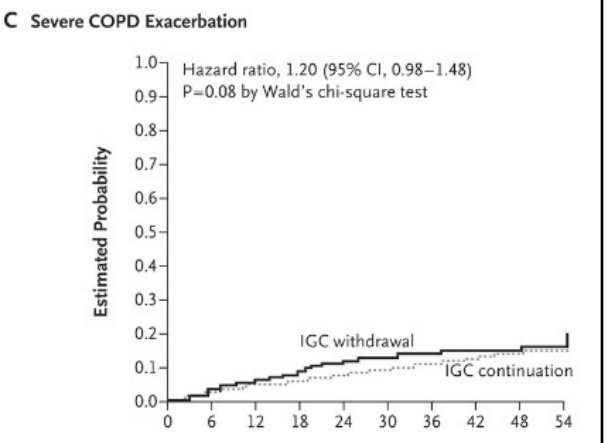
WISDOM TRIAL





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IGC: inhaled glucocorticoid
N Engl J Med 2014;371:1285-1294.

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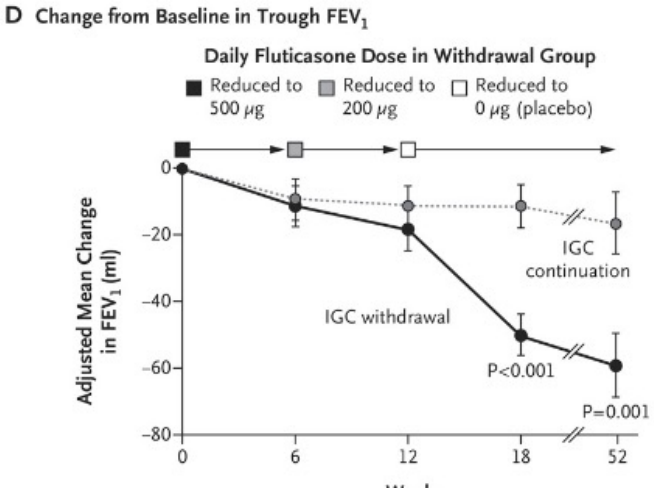
WISDOM TRIAL

- Similar risk of moderate or severe exacerbations
  - Stepwise withdrawal of glucocorticoids was noninferior to the continuation
- Greater decrease in lung function seen during the final step of glucocorticoid withdrawal
- No significant effect on mMRC score
- Similar rates of pneumonia in both groups



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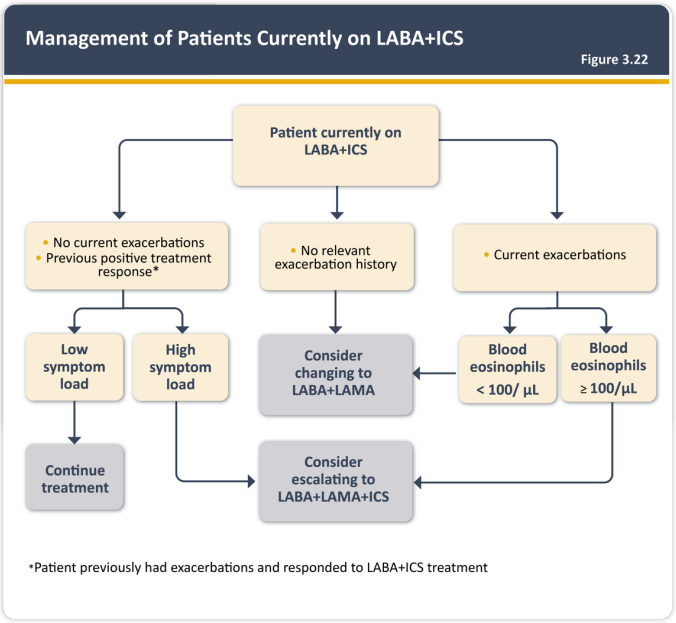

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Self-Assessment Question #3

LT is an 82-year-old male residing at home. He has a history of gout, HTN, type 2 diabetes, and COPD. He has been on aclidinium 400 mcg 1 inhalation twice daily for 6 months but still uses his albuterol nebulizer 3 times a week. Blood eosinophil count is 150.

What change to LT's inhaler regimen would be most appropriate?

a. Add fluticasone
b. Change to formoterol + budesonide
c. Change to olodaterol + tiotropium
d. Change to vilanterol + fluticasone +umeclidinium

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What now?

LT is an 82-year-old male residing at home. He has a history of gout, HTN, type 2 diabetes, and COPD. He has been on fluticasone and salmeterol for 2 years and his symptoms are well controlled. Blood eosinophil count is 150.

What change to LT's inhaler regimen would be most appropriate?

a. Change to formoterol + budesonide
b. Change to olodaterol
c. Change to vilanterol + fluticasone +umeclidinium
d. Keep the medications the same

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COPD – Inhaler Types

- Selecting a dosage form
  - Metered Dose Inhaler (MDI)- requires coordinated activation, hand strength, and slow and deep inhalation

  - Dry Powder Inhaler (DPI) — less coordination needed but requires adequate peak inspiratory volume and effort

- Soft Mist Inhaler (SMI) — gentler mist may deliver more medication but still requires coordinated activation, hand strength, and slow and deep inhalation

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COPD – Pharmacologic Agents

- Inhaler technique impacts drug delivery and effectiveness
  - Up to 90% of older adults use incorrect technique
  - Increased risk of inappropriate technique
    - Cognitive deficits
    - Hearing/vision problems
    - Physical disability (ex. stroke/decreased grip strength)
    - Multiple comorbidities and medications
    - Treatment complexity
- Poor technique linked with poor control/exacerbations
    - Use of 'teach back' education approach
- No benefit to using nebulizer when hand-held devices used properly
- Assess inhaler and spacer technique before labeling treatment as insufficient

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Key issues for patient education

- Long-acting agents should be dosed chronically to prevent future exacerbations
- Short-acting agents are best used for intermittent symptoms and acute exacerbations
- Reinforcing proper technique
  - Use of spacers is still appropriate to increase delivery of medication
- Rinsing the mouth following administration of an inhaled corticosteroid is recommended to reduce risk of oral thrush

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COPD - Managing Exacerbations

- Goals – minimize negative impact and outcomes
  - Symptoms typically last 7-10 days
  - Patients commonly (20%) don't immediately recover to pre-exacerbation status
  - Exacerbations contribute to disease progression
  - Exacerbations 'cluster' and predispose to another exacerbation
  - Mortality risk increases following exacerbation hospitalization (50% in 5 years)

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Exacerbation Pharmacotherapy

- Bronchodilators
  - SABA ± SAMA recommended for initial treatment of acute exacerbation; increase dose/frequency as needed
  - Use spacers/nebulizers when necessary
  - Initiate maintenance LAMA or LABA as soon as stable
- Corticosteroids
  - Consider to improve FEV1 and oxygenation and shorten hospitalization
  - 40 mg prednisone-equivalent per day for 5 days
  - PO vs IV equally effective

Global Initiative for Chronic Obstructive Lung Disease. 2025.

Exacerbation Pharmacotherapy

- Antibiotics (if indicated) shorten recovery time and hospital stay, reduce relapse risk
  - Amoxicillin/Clavulanic acid
  - Azithromycin
  - Doxycycline
- Indicated if signs of infection
  - 3 cardinal symptoms- dyspnea, sputum volume, and sputum purulence
  - 2 symptoms- sputum purulence plus dyspnea or sputum volume
  - Need for mechanical ventilation
- Limit duration to 5-7 days

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Global Initiative for Chronic Obstructive Lung Disease. 2025.

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COPD in Palliative, End-of-life, and Hospice Care

Dyspnea	Nutritional support	Panic, anxiety, & depression	Fatigue
May respond to opiates, neuromuscular electrical stimulation, chest wall vibration, fan blowing on the face	Beneficial in malnutrition/weight loss (improves muscle strength and QoL)	Inconclusive benefit with antidepressants, cognitive/behavioral and mind-body interventions may improve outcomes	Improved with pulmonary rehab, nutrition support, and mind-body interventions

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Global Initiative for Chronic Obstructive Lung Disease. 2025.

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COPD in Palliative, End-of-life, and Hospice Care

- End-of-life decisions regarding resuscitation, advanced directives and death preferences
  - Fear of worsening dyspnea and suffocation is real issue
  - Goals of care and wishes regarding avoiding unnecessary and costly invasive interventions should be discussed
  - Hospice services often necessary and beneficial to patients and family

Global Initiative for Chronic Obstructive Lung Disease. 2025.

COPD - Manage Comorbid Conditions

- In general, follow treatment guidelines for comorbid conditions
- Bronchiectasis –increases risk for more frequent exacerbations, chronic colonization by potentially pathogenic microorganisms (i.e. *Pseudomonas*) and higher mortality
- GERD increases risk of exacerbations and affects health status
- Asthma/COPD Overlap - risk increases with age and associated with poor prognosis
- Cardiovascular conditions – use cardioselective B-blockers, escalate doses slowly and monitor COPD symptoms
- Osteoporosis – more common in patients with COPD

Global Initiative for Chronic Obstructive Lung Disease. 2025.

COPD – Manage Comorbid Conditions

- Avoid medications that impact respirations
  - Non-selective B-blockers (carvedilol, propranolol, nadolol, timolol, sotalol, pindolol, penbutolol)
  - ACE inhibitors – may cause dry cough or worsen COPD cough
  - 1st generation antihistamines – dry and reduce clearance of mucus/sputum
  - Benzodiazepines – (esp long half-life) – respiratory depression
  - Opioids – reduced respiratory rate and volume
  - Zanamivir (Relenza®) – bronchospasm
  - Inhaled insulin (Afrezza®) – bronchospasm

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Managing Asthma in the Older Adult

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Asthma in Older Adults

- Frequently underdiagnosed in patients aged >65 years
  - Poor perception of airflow limitation, lack of fitness, and acceptance of dyspnea as "normal" part of aging or attributing symptoms to comorbidities
  - Underuse of objective testing (e.g. spirometry)
  - Difficult to distinguish from COPD
- Asthma-related mortality: decreasing among younger age groups, increasing in older age groups
  - Two-thirds of deaths attributed to asthma occur in people aged 65 years or older

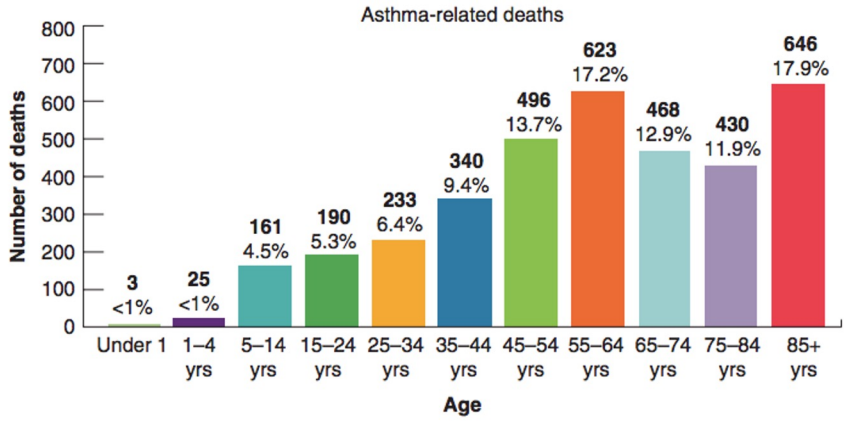
Global Strategy for Asthma Management and Prevention, 2024.
Lancet 2010; 376: 803–13.

Asthma in Older Adults

- The number of patients with asthma age >65 years is expected to increase dramatically
  - At least 2 million patients in 2009
- Clinical features
  - Progressive decreases in lung function (chest wall stiffness, muscular changes, loss of elastic recoil, airway remodeling)
  - May not report symptoms or attribute to comorbidities, obesity, or aging

The American Journal of Medicine. 2009;122: 6-11

Asthma Related Deaths



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https://www.aafa.org/asthma-capitals-asthma-related-mortality/

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Managing Asthma in Older Individuals

- Onset of symptoms in patients > 40 more likely due to COPD; difficult to attribute chronic airflow limitation due to asthma vs. COPD
- Asthma-COPD overlap- persistent airflow limitation with features of asthma and COPD
- Combined asthma and COPD causes
  - Frequent exacerbations
  - Poor quality of life (QoL)
  - Rapid lung function decline
  - High mortality
- Initiate treatment as for asthma (ICS is important component of therapy)

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Lancet 2010; 376: 803–13

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Managing Asthma in Older Individuals

- Initiating treatment
  - Role of inhaled corticosteroids (ICS) in asthma – reduce morbidity and death
  - Asthma mortality - even "mild" symptoms have significant risk of a life-threatening attack
  - Controller and reliever therapy should include ICS component
  - Do not treat using a LABA without ICS

Global Strategy for Asthma Management and Prevention, 2024.

SMART/MART

- SMART- Single Maintenance and Reliever Therapy
- MART- Maintenance and Reliever Therapy

- Contains ICS (any) and LABA (formoterol)
  - Formoterol is a long-acting beta agonist, but onset of action is about five minutes (the shortest onset of all LABAs)
  - Dulera® (mometasone-formoterol) and Symbicort® (budesonide-formoterol) are approved for MART, although budesonide-formoterol is what was studied

Assessing need for initial controller therapy

Symptoms	Medication
Symptoms less than 4-5 times per week	As needed ICS-formoterol
Symptoms most days, or waking once a week or more	Low dose maintenance ICS/formoterol (can also serve as rescue inhaler)
Symptoms most days or waking once a week or more, and low lung function	Medium dose ICS/formoterol (can also serve as rescue inhaler) *May also consider short course of oral corticosteroids for patients presenting with severely uncontrolled asthma

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Global Strategy for Asthma Management and Prevention, 2024.

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Adjusting Asthma Treatment

- Stepping up asthma treatment
  - Sustained step up (for at least 2–3 months)
  - Short-term step up (for 1–2 weeks)
  - Day-to-day adjustment
- Stepping down treatment when asthma is well controlled
  - Good control achieved and maintained for 3 months
    - Step down ICS dose by 25-50%
  - Maintain control of symptoms and exacerbations and minimize costs and side-effects

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Global Strategy for Asthma Management and Prevention, 2024.

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Stepping Up/Down Therapy

- In the past 4 weeks, has the patient had:
  - Daytime symptoms more than twice/week?
  - Any nighttime awakening due to asthma?
  - SABA* reliever needed more than twice/week?
  - Any activity limitation due to asthma?
- Well-controlled: None
- Partially controlled: 1-2 of these
- Uncontrolled: 3-4 of these

- *Only applies to patients with SABA reliever

Global Strategy for Asthma Management and Prevention, 2024.

Stepping Up/Down Therapy

Step	Medication
Steps 1-2	As needed ICS-formoterol
Step 3	Low dose maintenance ICS/formoterol (can also serve as rescue inhaler)
Step 4	Medium dose ICS/formoterol (can also serve as rescue inhaler)
Step 5	Add-on LAMA Consider high-dose maintenance ICS/formoterol, ± monoclonal antibody therapy (requires phenotype assessment)

Global Strategy for Asthma Management and Prevention, 2024.

SMART compared to:	Composite exacerbation endpoint (hospitalization, ED visit, oral corticosteroid use)	Number of patients & trials
Daily **higher-dose ICS** + PRN SABA Ages 4-11	RR=0.43 (0.21-0.83) NNT: 9 *included increased ICS use in composite *(Bisgaard et al. 2006)*	n=224 1 RCT
Daily **higher-dose ICS** + PRN SABA Ages 12+	RR=0.62 (0.53-0.71) NNT: 13 *(O'Byrne et al. 2005, Rabe et al. 2006, Scicchitano et al. 2004)*	n=3,741 3 RCTs
Daily **same-dose ICS-LABA** + PRN SABA Ages 4-11	RR=0.28 (0.14-0.53) NNT: 5 *included increased ICS use in composite *(Bisgaard et al. 2006)*	n=235 1 RCT
Daily **same-dose ICS-LABA** + PRN SABA Ages 12+	RR=0.68 (0.58-0.80) NNT: 16 *(Papi et al. 2013, Atienza et al. 2013, Patel et al. 2013, Rabe et al. 2006, Vogelmeier et al. 2005)*	n=8,483 5 RCTs
Daily **higher-dose ICS-LABA** + PRN SABA Ages 12+	RR=0.75 (0.59-0.96) NNT: 35 *(Kuna et al. 2007, Bousquet et al. 2007)*	n=6,742 2 RCTs

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Single Maintenance And Reliever Therapy (SMART) Study Outcomes

- Main critical outcome assessed was exacerbation composite
  - Hospitalizations, emergency department visits, oral corticosteroid use
- Most studies did not use validated quality of life or asthma control measures, but all unvalidated measures favored SMART group except when comparing to higher-dose ICS + LABA (no difference in asthma control or quality of life)
- No significant difference in severe adverse reactions in 11 RCTs

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Ann Allergy Asthma Immunol. 2022 Dec;129(6):703-708.

60

How to prescribe SMART

- All prescriptions for SMART should include full instructions for maintenance use, rescue use, and a maximum number of puffs/day for patient safety
  - Maintenance: usually two puffs twice daily
  - Rescue: similar to albuterol - # puffs (1-2), frequency (Q4-6H), PRN indication (increased shortness of breath/wheezing)
  - Max puffs: 12 for ages 12+

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Other Asthma Therapies

- Add-on therapies:
  - Tiotropium (only LAMA approved for asthma)
  - Leukotriene receptor antagonist (i.e. montelukast)
    - Monitor neuropsychiatric events
  - Biologics
- Not recommended – theophylline
  - Weak efficacy, numerous side effects
- House Dust Mite Sublingual Immunotherapy
- Separate guideline for "Difficult-to-treat and severe asthma"
  - May be necessary to refer to specialist

Global Strategy for Asthma Management and Prevention, 2024.

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Clinical Case – Asthma

- PT is a 67-year-old living in an assisted living community. He has mild dementia along with Type 2 diabetes, CAD, hypothyroidism, hypertension, and asthma.

- ASA 81 mg po daily
- Rosuvastatin 10 mg po daily
- Hydrochlorothiazide 12.5 mg po daily
- Famotidine 20 mg po BID
- Metformin 1000 mg po BID
- Liraglutide 1.8mg subq daily
- Metoprolol ER 100 mg po daily
- Albuterol HFA 2 puffs prn q4-6 hours
- Budesonide-formoterol HFA 80mcg-4.5 mcg 2 puffs BID

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Self-Assessment Question #4

Review of medication utilization shows one to three doses of PRN albuterol being administered weekly over the past 3 -4 weeks. What is the most appropriate recommendation at this time?

A. Increase albuterol to scheduled BID
B. Add tiotropium once daily
C. Increase to budesonide-formoterol HFA 160mcg-4.5 mcg
D. Decrease to budesonide only inhaler

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What about decreasing?

PT has been on a scheduled budesonide 160mcg-4.5 mcg inhaler as well as using it PRN. He has only needed to use an as needed dose once in the last 3 months and has no other symptoms.

Would you step down in therapy?

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Managing Allergic Rhinitis

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Managing Allergic Rhinitis in the Older Adult

- Overview
  - Increasing allergies and impact in older individuals > 60 y/o
  - Prevalence of allergic rhinitis in older patients approximately 5–8% and decreases with age
  - Allergic rhinitis in older people poorly recognized
- Differentiating chronic rhinitis in older adults
  - Allergic rhinitis
  - Non-allergic rhinitis
    - Vasomotor rhinitis
    - Atrophic rhinitis
    - Drug-induced rhinitis
    - Non-allergic rhinitis with eosinophilia

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Drugs Aging 2017; 34:21–28.

67

Pathophysiology of Allergic Rhinitis

- Immunoglobulin E (IgE)-mediated allergic inflammation in the nasal mucosa
- Varied response seen between 'young old' and 'old old'
  - Total IgE levels often lower in older adults
- Acute phase develops within minutes of allergen exposure
  - Primarily caused by histamine and arachidonic acid metabolites (leukotrienes, prostaglandins, and thromboxanes)
  - May cause intense symptoms in younger years and nearly absent in later life
- Late-phase occurs within 6–12 h of exposure
  - Characterized by an influx of monocytes, T lymphocytes, basophils, and eosinophils into the nasal mucosa
  - May be overlooked in older adults due incomplete response

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Drugs Aging 2017; 34:21–28.

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Pharmacological treatment

Selection of agents based on clinical symptoms (systemic vs localized)

Eliminate allergens if possible

First line therapy as targeted as possible

- Intranasal glucocorticoids
- Oral antihistamine drugs

Drugs Aging 2017; 34:21–28.

69

Targeting Pharmacologic Treatment

- Risk of adverse events increases exponentially with the number of drugs used
- Risk is higher with concomitant liver or renal impairment
- Lack of specific data on interactions with rhinitis drugs in the older adult
  - General risk due to reduced hepatic metabolism
  - Additive anticholinergic activity with effect on urinary retention, constipation, and delirium risk

Drugs Aging 2017; 34:21–28.

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Intranasal Glucocorticoids

- Commonly used in upper airway diseases
- Greater nasal symptom relief than topical antihistamines (H1 receptor antagonists)

Beclomethasone dipropionate	Budesonide	Ciclesonide	Flunisolide
Fluticasone furoate	Fluticasone propionate	Triamcinolone acetonide	Mometasone furoate

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Drugs Aging 2017; 34:21–28.

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Intranasal Glucocorticoids

- Localized anti-inflammatory activity
- Well tolerated although little focused study in the older adult
- Adverse reactions identical to those in younger population (epistaxis, dryness and burning sensation)
- Prolonged use often unblocks nose and improves olfaction
- Unknown role of chronical nasal steroids on osteoporosis and diabetes; monitoring suggested

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Drugs Aging 2017; 34:21–28.

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Systemic Glucocorticoids

- Not recommended for allergic rhinitis in older patients
- Some guidelines permit use in severe allergic rhinitis
- Adverse events typical with systemic steroid use; may negate the benefits
- Adverse events (osteoporosis, diabetes, and arterial hypertension) frequent but individual response depends on age

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Drugs Aging 2017; 34:21–28.

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Antihistamines

- Standard therapy for most types of allergic rhinitis, conjunctivitis and other allergic skin diseases
- Good absorption when administered orally, most provide effective plasma concentration within 3 hrs after oral administration
- Second-generation antihistamines
  - Little antagonist activity against the anticholinergic and alpha-adrenergic receptors
  - Desloratadine and loratadine interact with cholinergic receptors; not indicated for patients with dry eye syndrome and other conditions
  - Most second-generation agents metabolized by cytochrome 450 enzymes; use not recommended with significant liver dysfunction
  - Lack of specific data on use in older adults

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Drugs Aging 2017; 34:21–28.

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Antihistamines

	First-generation antihistamines	Second-generation antihistamines
Available products	Diphenhydramine, chlorpheniramine, doxylamine, etc.	Fexofenadine, cetirizine, loratadine, levocetirizine, desloratadine
Cross the blood-brain barrier	Yes	Relatively low rate
Histamine receptor specificity	Less selective	High affinity for the H1 receptor
Safety	High risk of adverse reactions - anxiety, confusion, dyskinesias, sedation or sleepiness, arrhythmias, urinary disturbances, constipation, hypotension, memory dysfunction, and problems with kinetic coordination that lead to falls	Less likely to cause adverse central nervous effects than older H1-antagonists

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Drugs Aging 2017; 34:21–28.

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Treatment Options for Allergic Rhinitis

Decongestants

- Commonly used as topical or systemic drugs to reduce nasal blockage
- Often overused and not considered first-line therapy
- Should not be used as monotherapy, particularly for a prolonged period
- May cause many adverse events (increased arterial hypertension, headache, arousal, prostatism, aggravation of glaucoma, and urination)

Antileukotrienes

- Antagonism of cysteinyl leukotrienes (CysLTs) potential target for allergic rhinitis management
- Combined antileukotrienes and antihistamines show synergistic effect in seasonal allergic rhinitis
- Acts quickly on all nasal symptoms and well tolerated in older patients
- Boxed Warning (montelukast): neuropsychiatric events

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Drugs Aging 2017; 34:21–28.

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Treatment Options for Allergic Rhinitis

- Intranasal anticholinergics (ipratropium)
  - Generally well tolerated with no systemic adverse effects
  - More commonly used in non-allergic rhinitis
- Nasal irrigation with isotonic sodium chloride
  - Recommended in nasal dryness with allergic rhinitis
  - Beneficial for removing the nasal mucosa in patients with an aging nose and dryness

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Drugs Aging 2017; 34:21–28.

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Self-Assessment Question #5

PD is a 71-year-old coming to your clinic for a hypertension management visit. She makes a comment that her loratadine doesn't seem to be working as well for her ragweed symptoms, particularly her runny nose. What is the most appropriate recommendation for her?

A. Discontinue loratadine and start diphenhydramine
B. Add pseudoephedrine to loratadine
C. Change loratadine to scheduled fluticasone nasal spray
D. Refer to allergist to initiate allergen desensitization injections

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Other Respiratory Issues in the Older Adult

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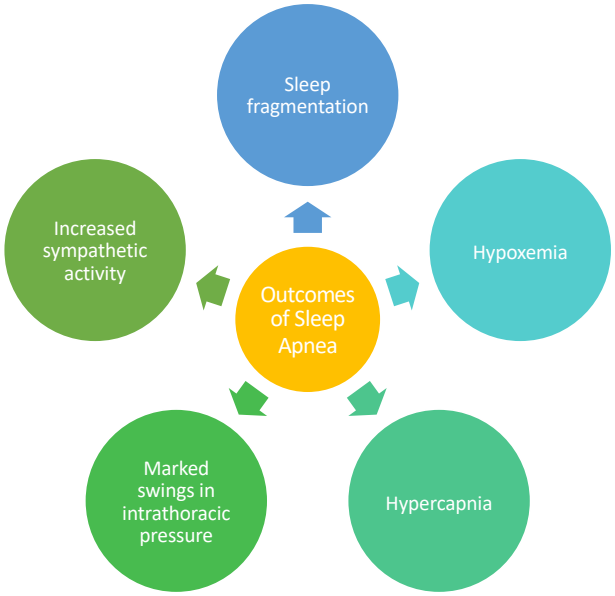
Sleep Apnea in the Older Adult

- Common disorder (2% - 4%) of adults
- Three types of sleep apnea: obstructive, central, and mixed
- Caused by repetitive collapse of the upper airway



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J Clin Sleep Med 2009;5(3):263–276.
JAMDA 2007; 18: 899-904.

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Sleep Apnea Treatment Approach

- Requires long-term, multidisciplinary management
- Includes medical, behavioral, and surgical treatment of obstructive sleep apnea (OSA)
- Positive airway pressure (PAP) is treatment of choice for mild, moderate, and severe disease and should be offered as an option to all patients
- Alternative therapies may be effective
- Desired outcomes: resolution of clinical symptoms and normalization of the Alpha Hypopnea Index (AHI) and oxyhemoglobin saturation
- Therapy difficult for patients with Down syndrome and cognitive disorders

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J Clin Sleep Med 2009;5(3):263–276.

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Managing Sleep Apnea in the Older Adult

- No widely effective pharmacotherapies; exceptions include hypothyroidism or acromegaly
- Therapies NOT recommended
  - Selective serotonergic uptake inhibitors (SSRIs)
  - Protriptyline
  - Methylxanthine derivatives (aminophylline and theophylline)
  - Estrogen therapy (estrogen preparations with or without progesterone)
  - Short-acting nasal decongestants
  - Oxygen supplementation not recommended as a primary treatment
    - May reduce nocturnal hypoxemia but may prolong apneas
    - May potentially worsen nocturnal hypercapnia in patients with comorbid respiratory disease

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J Clin Sleep Med 2009;5(3):263–276.

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Recommended Therapies for Sleep Apnea

- Tirzepatide approved in 2024 for use of OSA
  - Maintenance dose of 10 or 15mg dose
  - Change in AHI- estimated treatment difference of −20.0 to -23.9 events per hour
  - Improvement in sleep apnea specific hypoxic burden
  - Approximately 17% decrease in body weight

N Engl J Med 2024;391:1193–205.

Recommended Therapies for Sleep Apnea

- Topical nasal corticosteroids effective with concurrent rhinitis
- Modafinil for residual excessive daytime sleepiness
  - Despite effective PAP treatment
  - Exclude other cause of sleepiness
    - Suboptimal objective adherence with PAP
    - Ill-fitting PAP masks
    - Poor sleep hygiene
    - Other sleep disorders such as narcolepsy or restless legs syndrome/periodic limb movements of sleep; and depression.
- Modafinil should be used in addition to PAP therapy

J Clin Sleep Med 2009;5(3):263–276.

Clinical Case – Sleep Apnea

JM is a 71-year-old who volunteers part-time at the VA hospital escorting Veterans to their appointments. He has noticed that he is quite sleepy during the day. His fellow volunteers often catch him napping during downtime. JM confirms feeling quite drowsy during the day, despite sleeping 7-8 hours. In the past year, he has been sleeping in his spare bedroom so as not to disturb his wife with his snoring.

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Self-Assessment Question #6

What is the most appropriate suggestion for JM to investigate his sleeping issues?

A. See a sleep specialist to inquire about a positive airway appliance
B. Consult an oral-nasal surgeon to investigate surgical options
C. Ask his internist to prescribe a sleep aid such as zolpidem
D. Purchase an adjustable bed

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Respiratory Related Vaccines for Older Adults

- Pneumococcal vaccines
  - PCV15 or PCV20 or PCV21 given at age 50 if no previous vaccine or PPSV23 previously
    - If PCV15 given, PPSV23 1 year later
  - PCV15 or PCV20 given at age 50 if PPSV23 given at least 1 year prior
    - No need for follow up PPSV23
- Yearly influenza vaccine
  - Any one of HD-IIV3 (High-dose inactivated), RIV3 (Recombinant influenza), or aIIV3 (Adjuvanted inactivated influenza)
  - If none available, than any other flu shot

https://www.cdc.gov/vaccines/schedules/hcp/imz/adult.html

Respiratory Related Vaccines for Older Adults

- Respiratory Syncytial Virus (RSV)
  - Age 75 years or older
    - Unvaccinated: 1 dose (Arexvy or Abrysvo or mResvia)
  - Age 60–74 years:
    - Unvaccinated and at increased risk of severe RSV disease: 1 dose (Arexvy or Abrysvo or mResvia).
    - Persons 60 years and older can get RSV vaccine at any time but best to administer in late summer and early fall before RSV spreads in communities—ideally August through October in most of continental United States.

https://www.cdc.gov/vaccines/schedules/hcp/imz/adult.html

Respiratory Related Vaccines for Older Adults

- Pertussis (whooping cough)- receive one time dose of Tdap
  - Booster doses can be either Tdap or Td (every 10 years)
- COVID-19 Vaccine
  - Age 65 + and unvaccinated: 1 dose of Moderna or Pfizer and 2 doses of Novavax plus additional dose 6 months later
  - Age 65+ and previously vaccinated should receive 2 doses updated mRNA vaccine or adjuvanted vaccine regardless of primary series

https://www.cdc.gov/vaccines/schedules/hcp/imz/adult.html

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