

# Sputum Talks: Clearing the Way in Bronchiectasis

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**Lisa Hinman, CRT**
*Clinical Specialist*

# DISCLOSURES

**Lisa Hinman**

- Employee of Electromed Inc.

**Mindy Conklin**

- Electromed, Inc.
- Monaghan Medical Corporation
- VAPOTHERM

# LEARNING OBJECTIVES

## Bronchiectasis

- Review disease, prevalence, causes, and symptoms

## Sputum

- Discuss sputum properties in the bronchiectasis patient population

## Management

- Discuss bronchiectasis diagnosis and treatment options

## Airway Clearance Therapies

- Review airway clearance therapy modalities and patient education

# PATIENT CASE

# PATIENT HISTORY

## History

- 65-year-old female
- Non-smoker
- Severe childhood pneumonia
- No secure diagnosis of COPD or asthma
  - On ICS/LABA inhaler

## Symptoms

- Chronic productive cough with mucopurulent sputum x 2 years
- Dyspnea on exertion
- Fatigue
- Wheezing

## Recent Illness

- 3 exacerbations within past 12-months
  - 2 requiring oral antibiotics
  - 1 requiring hospitalization

# PATIENT PHYSICAL EXAMINATION

+ Thin Female

- No clubbing

- No nasal polyps

- No peripheral edema

**96%**

oxygen saturation on room air

**Coarse Crackles**

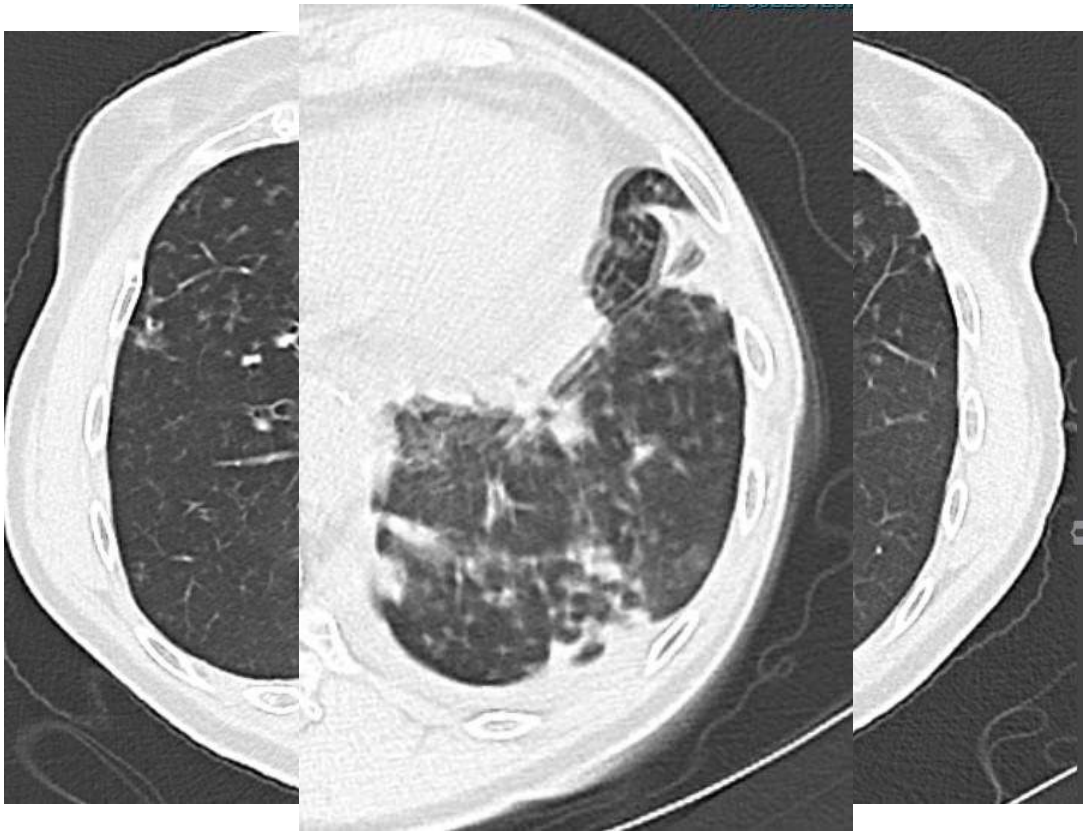
right lower lobe

# PATIENT TEST RESULTS

| | |
|---|---|
| **SPIROMETRY** | **MODERATE AIRFLOW OBSTRUCTION**<br>FEV1 **65%** of predicted<br>FEV1/FVC **69%** of predicted |
| **DIAGNOSTICS** | **WITHIN NORMAL LIMITS**<br>Bacteria-specific antibody levels<br>Immunoglobulin G level<br>CFTR genotyping |
| **SPUTUM** | **POSTIVE:** ***Pseudomonas aeruginosa***<br>**NEGATIVE:** Mycobacterial cultures |

# PATIENT HIGH RESOLUTION CT SCAN

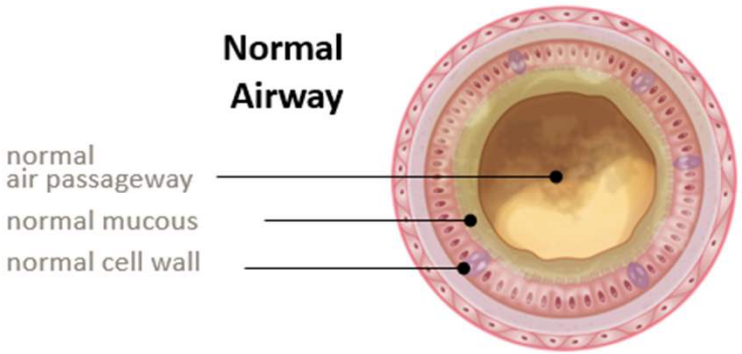
+ Cylindrical **bronchiectasis** in the lower lobes
+ Airway wall thickening
+ Mucus plugging
- No nodules
- No masses
- No interstitial lung disease

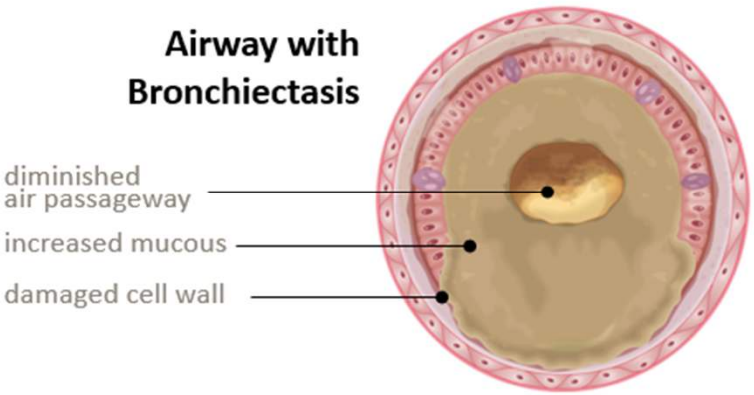




# BRONCHIECTASIS

# BRONCHIECTASIS (bron-kee-eck-tuh-sis)



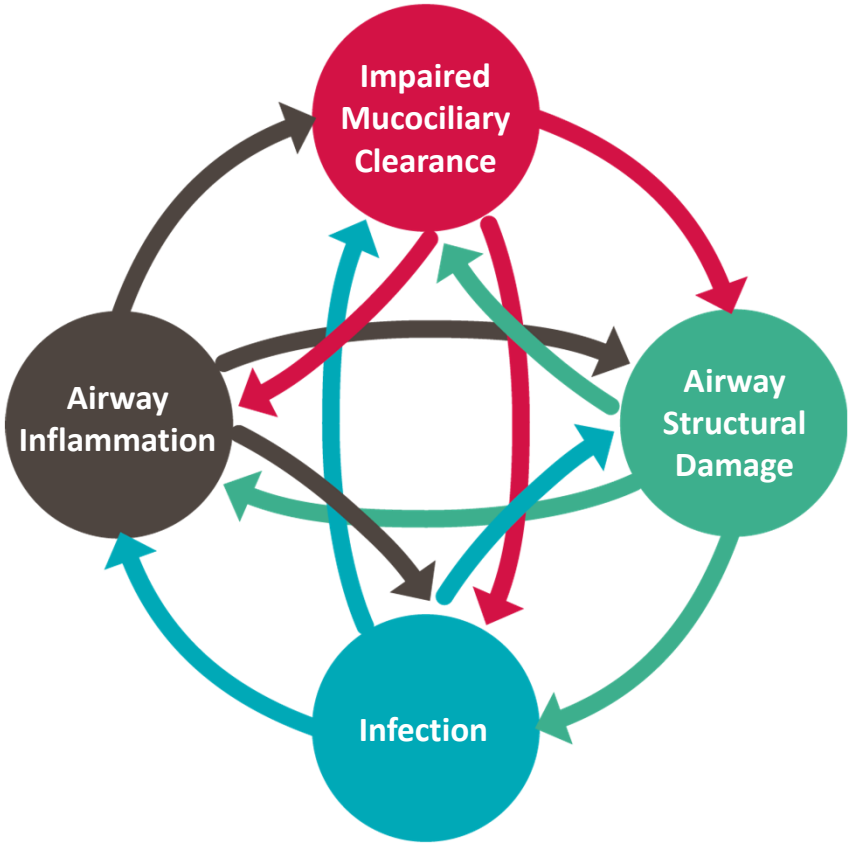

Abnormal widening and thickening of the airways

Mucus builds up in damaged airways

Mucus build-up may lead to infections, inflammation, and further lung damage

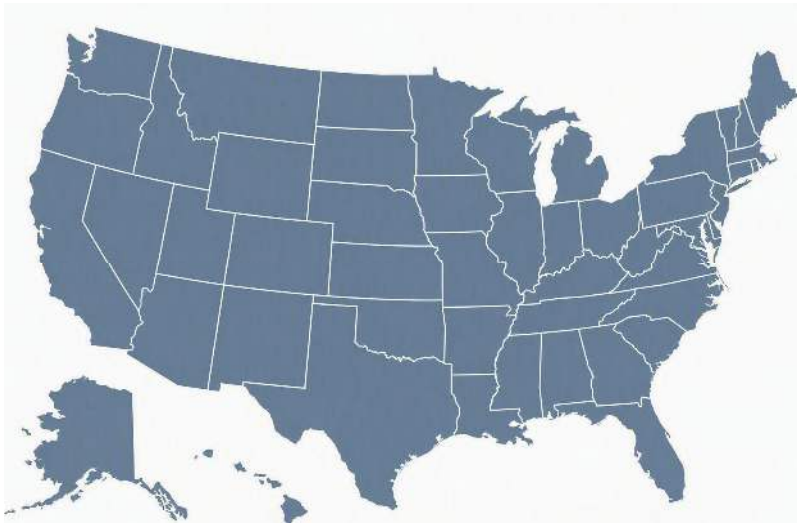
https://www.bronchandntm.org/For-Patients/Learn-More/Diagnoses-and-Evaluation/Understanding-Bronchiectasis

# VICIOUS VORTEX OF BRONCHIECTASIS




Flume, PA., Chalmers JD., Olivier, KN. Advances in bronchiectasis: endotyping, genetics, microbiome, and disease heterogeneity. *Lancet*. 2018 September 08; 392(10150): 880-890. doi: 10.1016/S0140-6736(18)31767-7

# BRONCHIECTASIS PREVALENCE AND BURDEN



Only about 1 in 9 US adults with bronchiectasis is diagnosed



**500,000 diagnosed** **4 million undiagnosed**

- 701 per 100,000
- 8% annually growth

- Female predominant
- ↑ NTM & *P. aeruginosa*

- 52% hospitalized within 1 year
- Annual medical costs $$$

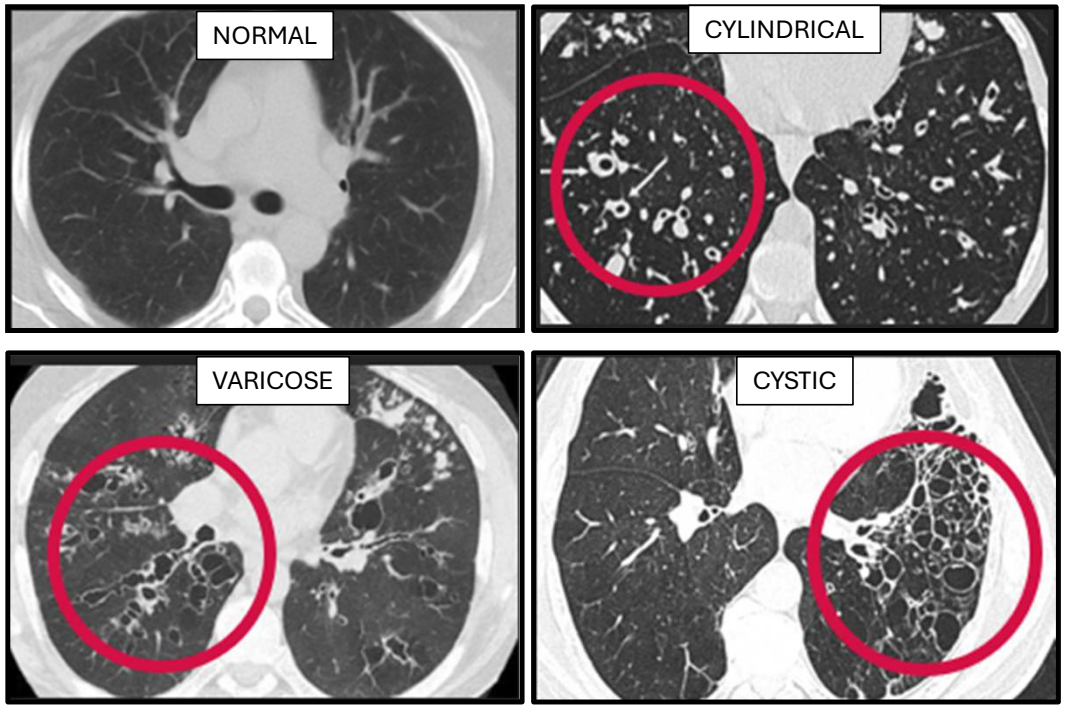
Im Y, Henkle E, Choi H. Epidemiology of bronchiectasis. In: Chalmers JD, Shoemark A, Aliberti S, eds. Bronchiectasis (ERS Monograph). Sheffield, European Respiratory Society, 2026; pp. 13–28 [https://doi.org/10.1183/2312508X.10001025].
Weycker, D, Hansen GL, Seifer FD. Prevalence and incidence of noncystic fibrosis bronchiectasis among US adults in 2013. *Chronic Respiratory Disease*. 2017; 14(4):377-384, doi:10.1177/1479972317709649

# BRONCHIECTASIS DIAGNOSIS

HRCT is gold standard for diagnosis

25% of patients wait ≥ 10 years to be diagnosed

Delayed diagnosis results in recurrent exacerbations and progressive lung damage




https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(26)00017-2/fulltext#box1

# BRONCHIECTASIS ETIOLOGIES



**Post-infectious**
- Tuberculosis
- Pneumonia
- NTM



**Immunodeficiencies**
- Common variable immunodeficiency
- HIV



**Autoimmune**
- Rheumatoid arthritis
- Inflammatory bowel disease



**Genetic**
- Cystic Fibrosis
- Primary Ciliary Dyskinesia
- Alpha-1 antitrypsin deficiencies



**Gastrointestinal**
- Gastroesophageal reflux disease
- Aspiration

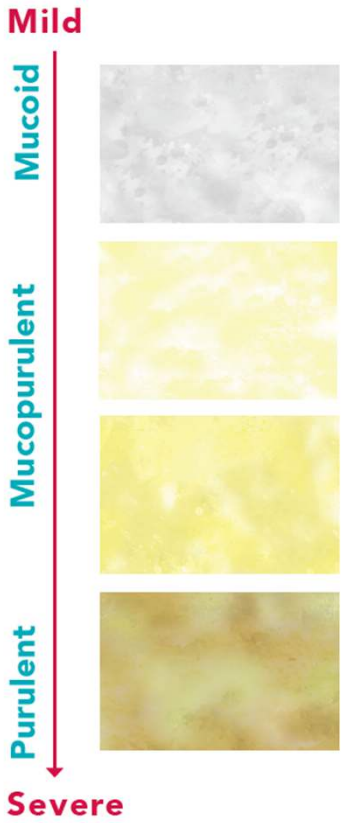


**Idiopathic**
- 40-50% of BE patients

Halaseh, RM., Al-Ahmad, M. Boppana, L., et al. Bronchiectasis: Past insights, present clinical evidence, and future research pathways. *Respiratory Medicine,* 2026; 254, 108744

# BRONCHIECTASIS SYMPTOMS

- Recurrent respiratory infections
- Chronic productive cough
- Hemoptysis
- Fatigue
- Wheezing




Bronchiectasis and NTM Research Registry: 2021 Registry Highlights. (2021).
https://www.bronchiectasisandntminitiative.org/Research/Registry/Bronchiectasis-and-NTM-Research-Registry

# BRONCHIECTASIS GUIDELINES

**NORTH AMERICA**
American College of Chest Physicians (CHEST)



**EUROPE**
European Respiratory Society (ERS)



**AUSTRALIA & NEW ZEALAND**
Thoracic Society of Australia & New Zealand (TSANZ)



**SPAIN**
Spanish Society of Pulmonology and Thoracic Surgery (SEPAR)



**UNITED KINGDOM**
British Thoracic Society (BTS)



# BRONCHIECTASIS SCORING SYSTEMS

## Bronchiectasis Severity Index (BSI)

- Assessment of morbidity and mortality
- Predicts 1 and 4-year hospitalization, exacerbation, and mortality rate
- Estimates disease severity

## FACED

- Assessment of morbidity and mortality
- Estimates disease severity

## Chronic Airway Assessment Test (CAAT)

- Assessment of disease state and quality of life
- Worsening score could represent an exacerbation, poor adherence to medication or airway clearance, or progression of disease

# PATIENT REVIEW

**Diagnosis**
Idiopathic Non-Cystic Fibrosis Bronchiectasis

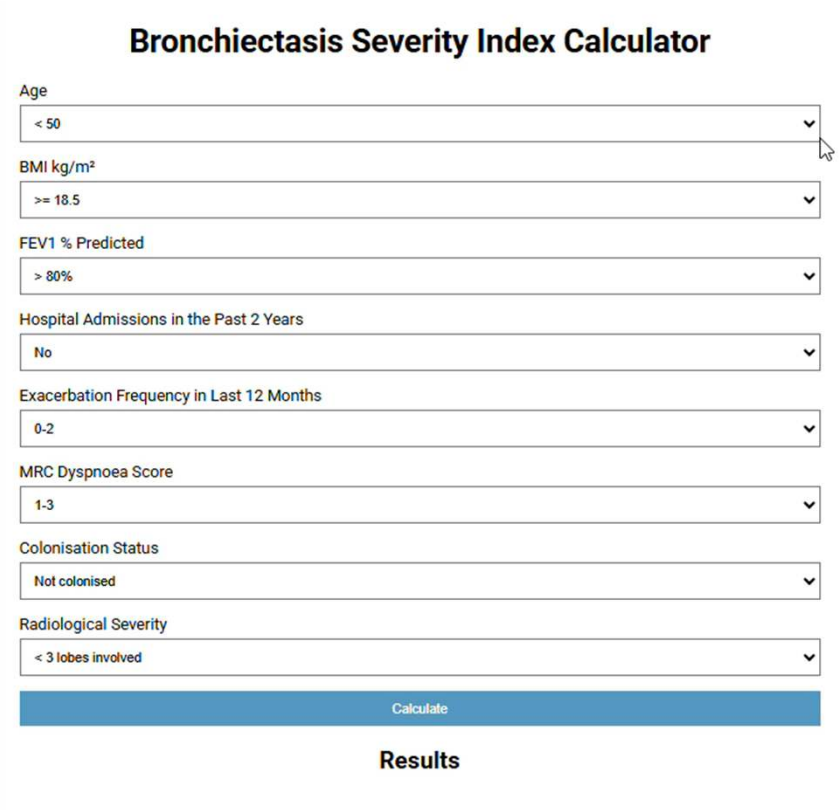
**Bronchiectasis Severity**

**BSI:**

**FACED:**

**CAAT:**

# PATIENT REVIEW



# PATIENT REVIEW

**Diagnosis**
Idiopathic Non-Cystic Fibrosis Bronchiectasis

**Bronchiectasis Severity**

**BSI: 13 - Severe Bronchiectasis**

- 1-year outcome: 7.6 – 10.5% mortality rate, 16.7 – 52.6% hospitalization rate
- 4-year outcome: 9.9 – 29.2% mortality rate, 41.2 – 80.4% hospitalization rate

**FACED:**

**CAAT:**

# PATIENT REVIEW

| | | | |
|---|---|---|---|
| **F** | FEV1 | ≥50% = 0 points | **<50% = 2 points** |
| **A** | Age | **<70 years = 0 points** | ≥70 years = 2 points |
| **C** | Chronic colonization | No Pseudomonas = 0 points | **Presence of Pseudomonas = 1 point** |
| **E** | Extension | **1-2 lobes affected = 0 points** | >2 lobes affected = 1 point |
| **D** | Dyspnea | mMRC 0-2 = 0 points | **mMRC 3-4 = 1 point** |

# PATIENT REVIEW

**Diagnosis**
Idiopathic Non-Cystic Fibrosis Bronchiectasis

**Bronchiectasis Severity**

**BSI: 13 - Severe Bronchiectasis**

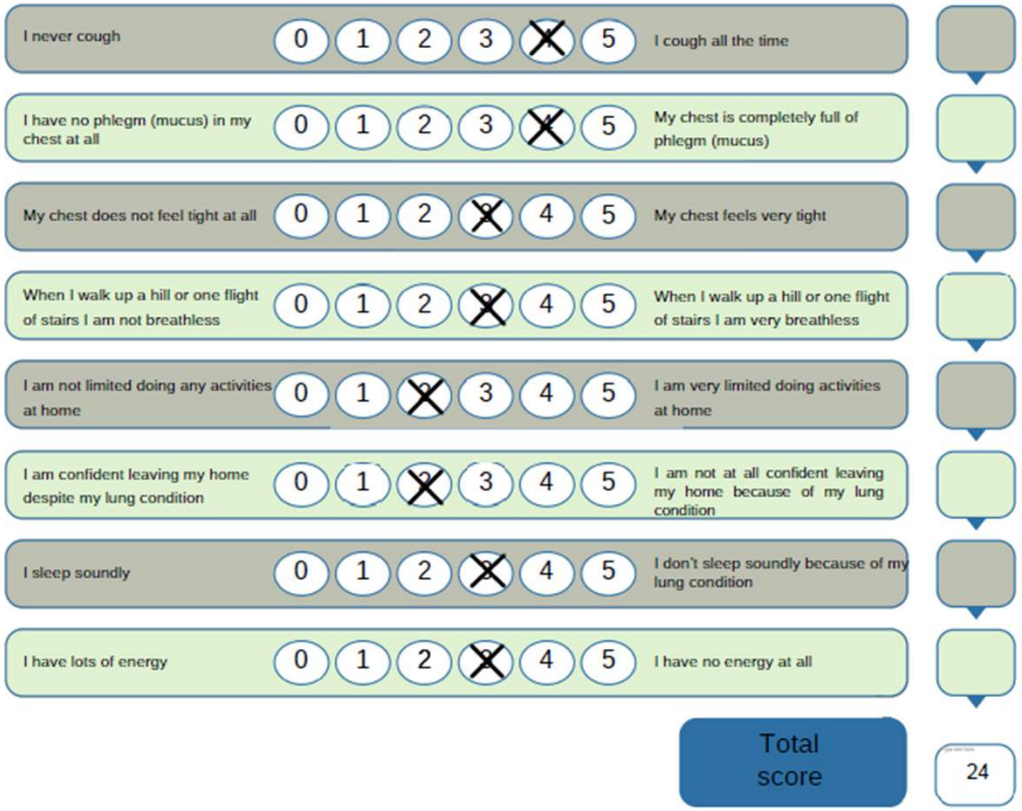
- 1-year outcome: 7.6 – 10.5% mortality rate, 16.7 – 52.6% hospitalization rate
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**FACED: 4 - Moderate Bronchiectasis**

- Verge of severe bronchiectasis

**CAAT:**

# PATIENT REVIEW



# PATIENT REVIEW

**Diagnosis**
Idiopathic Non-Cystic Fibrosis Bronchiectasis

**Bronchiectasis Severity**

**BSI: 13 - Severe Bronchiectasis**

- 1-year outcome: 7.6 – 10.5% mortality rate, 16.7 – 52.6% hospitalization rate
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**FACED: 4 - Moderate Bronchiectasis**

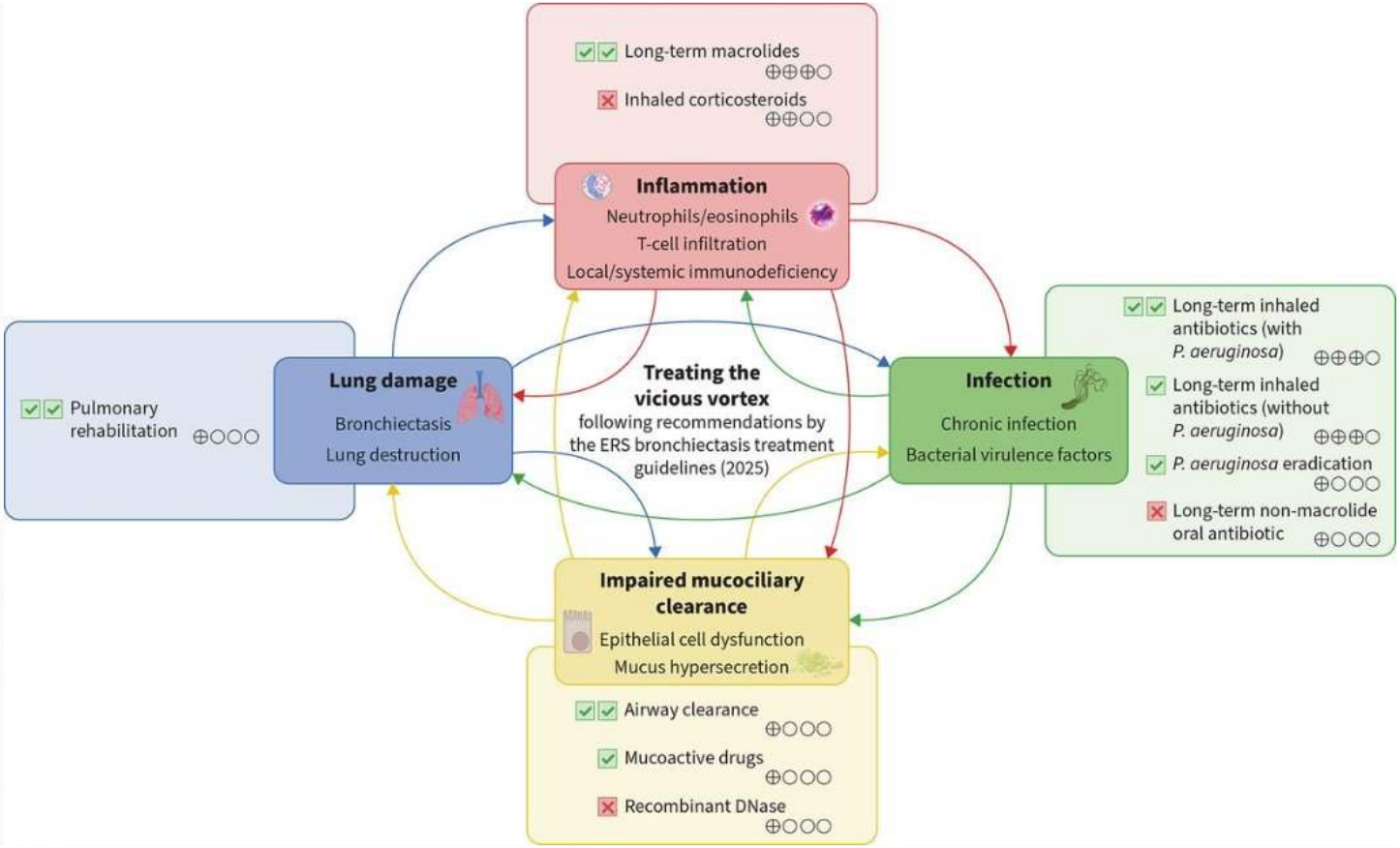
- Verge of severe bronchiectasis

**CAAT: 24**

- Score of 10+ suggests significant symptoms

# BRONCHIECTASIS TREATMENT

# BRONCHIECTASIS TREATMENT

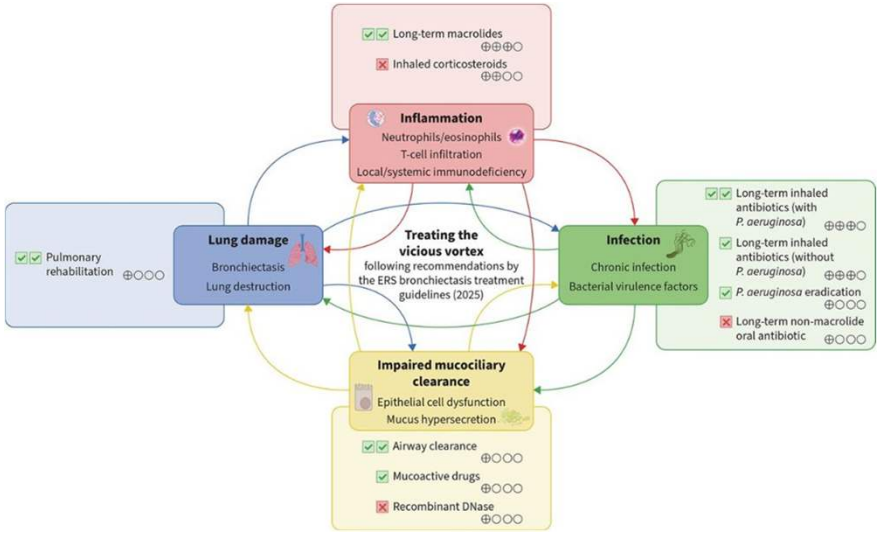



Chalmers JD, Haworth CS, Flume P, et al. European Respiratory Society clinical practice guideline for the management of adult bronchiectasis. Eur Respir J 2025; 66: 2501126 [DOI: 10.1183/13993003.01126-2025]

# PATIENT MANAGEMENT

**Multi-Modal Treatment Approach**

- **Bronchodilators**
  - LABA inhaler; Stopped ICS
- **Antimicrobials**
  - 14-day course of oral levofloxacin
- **Mucolytics**
  - Nebulized 7% hypertonic saline
- **HFCWO**
  - 20 minutes BID
- **OPEP & Active Cycle Breathing**



# AIRWAY CLEARANCE GOALS

- Decrease symptom burden
- Reduce infections and exacerbations
- Prevent mucus plugs and atelectasis
- Preserve lung function
- Improve quality of life



McShane, PJ, & Tino, G. Bronchiectasis. CHEST. 2019 Apr; 155(4):825-833. doi: 10.1016/j.chest.2018.10.027. Epub Nov4

# AIRWAY CLEARANCE MANAGEMENT




Spinou A, Herrero-Cortina B. Airway clearance management in bronchiectasis: techniques, devices and mucoactive agents. *In:* Chalmers JD, Shoemark A, Aliberti S, eds. Bronchiectasis (ERS Monograph). Sheffield, European Respiratory Society, 2026; pp. 244–260 [https://doi.org/10.1183/2312508X.10002425].

# AIRWAY CLEARANCE THERAPIES



BREATHING TECHNIQUES



OPEP



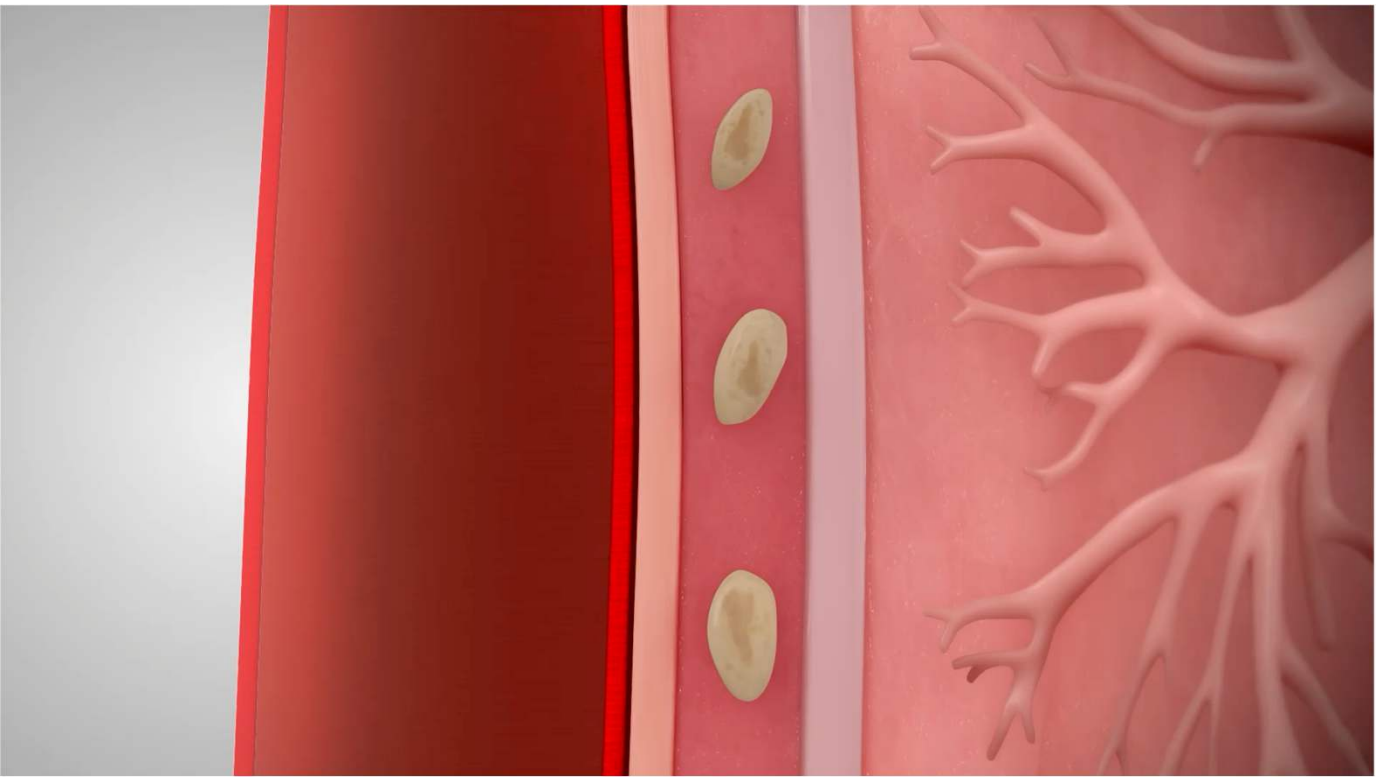
HYPERTONIC SALINE



HFCWO

Thomson R, Thornton C, Aksamit T, et al. Management of Adult Bronchiectasis: An American College or Chest Physicians Clinical Practice Guideline. CHEST. 2026. DOI: https://doi.org/10.1016/j.chest.2026.06.057

# HIGH FREQUENCY CHEST WALL OSCILLATION



**Sheers** mucus off the walls of the airway

**Thins** secretions by reducing viscosity

**Propels** mucus towards larger airways

Sievert CE, et al. 2016. Using high frequency chest wall oscillation in a bronchiectasis patient population: An outcomes-based case review. Respiratory Therapy, 11(4), 34-38.

# HFCWO DATA FROM THE BRONCHIECTASIS RESEARCH REGISTRY



Why didn't we receive HFCWO?

**AIM 1 (HFCWO) Total Participants n=5673**

| AIM 1 (%) | Prescribed HFCWO n =518 | Not Prescribed HFCWO n=5155 |
|---|---|---|
| Asthma | 31.7 | 25.3 |
| COPD† | 17.0 | 16.3 |
| Dyspnea | 72.1 | 38.5 |
| Fatigue | 61.5 | 46.8 |
| Cough | 90.9 | 76.6 |
| P. aeruginosa | 34.5 | 22.0 |

†not significant; all others p<0.002

**9%** At baseline** evaluation, only **9% of BE** patients were prescribed HFCWO for airway clearance.

**AIM 2 (No HFCWO) Total Participants n=4679**

| AIM 2 (%) | Met CMS Criteria* n=2703 | Did Not Meet CMS Criteria n=1976 |
|---|---|---|
| Asthma | 28.0 | 21.3 |
| COPD | 18.4 | 13.5 |
| Dyspnea | 45.7 | 31.3 |
| Fatigue | 52.4 | 38.7 |
| Cough | 97.3 | 46.1 |
| P. aeruginosa | 27.0 | 13.2 |

all comparisons p<0.001

**58%** **2703/4679** of qualifying patients did not receive HFCWO therapy but met the CMS criteria at baseline.

**AIM 3**

**13%** of patients **not prescribed HFCWO at baseline later received it**—and were found to be more clinically unstable, with higher rates of exacerbations, hospitalizations, and antibiotic use.[1]

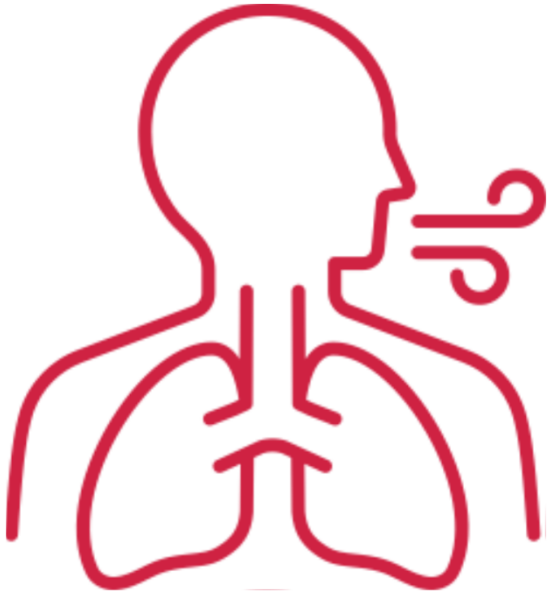
**58%** of patients without HFCWO met clinical criteria

Patients who qualified for HFCWO were sicker

Feir, C., et al. *Pulmonary Medicine,* 2026, 6884898, 69-70, 2026. https://doi.org/10.1155/pm.6884898

# AIRWAY CLEARANCE SELECTION

- Coordination
- Expiratory flow and strength
- Understanding and cognition
- Tolerance
- Preference



# PATIENT FOLLOW-UP

## 3-Month Follow-Up Appointment

### Assessment of Symptoms

- Reduced sputum production
- Improved cough
- Resolution of wheezing
- No respiratory exacerbations
- Improved energy levels

### Follow-up PFTs and Imaging

- FEV1 improved from 65% to 72% of predicted
- Significant improvement in lower lobe mucus plugging

Ali MH, *Diagnosis of bronchiectasis and rapid stabilization following HFCWO initiation in a patient with recurrent respiratory symptoms.* Electromed CL-07 2025-02

# PATIENT FOLLOW-UP



Initial HRCT



3-Month Follow-Up HRCT

# PATIENT REVIEW

## Early Identification

Identify bronchiectasis earlier in patients with recurrent respiratory infections and chronic sputum production

## Treatment Management

Earlier initiation of HFCWO, in addition to other bronchiectasis treatments, may help to significantly improve patient's clinical outcomes

## Clinical Outcomes

Appropriate treatment and ACT optimization should decrease symptoms, infections and exacerbations, and improve cough, sputum mobilization, and QoL

# SUMMARY

> 4 million adults with undiagnosed bronchiectasis in the U.S.

Bronchiectasis guidelines support ACT as a mainstay treatment

Follow-up, assess ACT therapy response, and adjust if needed

ACT goal is to improve quality of life!



**RECOGNIZE**
Bronchiectasis & initiate ACT



**REASSESS**
Symptoms & ACT approach



**RECOMMEND**
ACT adjustment if needed

# RESOURCES

Bronchiectasis & NTM ASSOCIATION

*bronchiectasisandntminitiative.org*

NTMir Nontuberculous Mycobacteria Info & Research

*ntminfo.org*

# Thank You!

**Mindy Conklin, MRT, RRT-ACCS, AE-C**
**Lisa Hinman, CRT**
***ELECTROMED, INC.***

# Q&A