

Bronchiectasis Management: From Guidelines to Patient Care

Presented by:
Timothy R. Aksamit, MD, FCCP, ATSF
Alyssa Dittner, BSRT, RRT, PDE, TTS



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****This presentation was created to inform and educate respiratory therapists.****

Disclosure – TR Aksamit, MD

Director: Bronchiectasis and NTM Association

Past-chair: U.S. Bronchiectasis Research Registry

Research clinical study activity:

- U.S. Bronchiectasis Research Registry
- Bayer, Cipro DPI, Global PI
- Aradigm/Grifols, Cipro liposomal
- Insmed, inhaled liposomal amikacin, brensocatic
- BI, BI1291583
- Verona, ensifentrine
- Zambon, inhaled colistin
- AztraZeneca, benralizumab
- Armata, AP-PA02 phage
- Spero, SPR720
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None



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Disclosure – A Dittner, BSRT, RRT, PDE, TTS

- Assistant Director of Education and Community, Bronchiectasis and NTM Association
- No relevant financial relationships to disclose

Bronchiectasis Pathway Card

mMRC Breathlessness Scale

Grade	Description of Breathlessness
0	I only get breathless with strenuous exercise
1	I get short of breath when hurrying on level ground or walking up a slight hill
2	On level ground, I walk slower than people of the same age because of breathlessness, or have to stop for breath when walking at my own pace
3	I stop for breath after walking about 100 yards or after a few minutes on level ground
4	I am too breathless to leave the house or I am breathless when dressing

A mMRC score of 2 or more suggests significant symptoms.

Chris Stanton. The mMRC breathlessness scale. *Occup Med (Lond)* 2008;58(3): 226-227 doi:10.1093/occmed/kqn162, Table 1. By permission of Oxford University Press on behalf of the Society of Occupational Medicine.

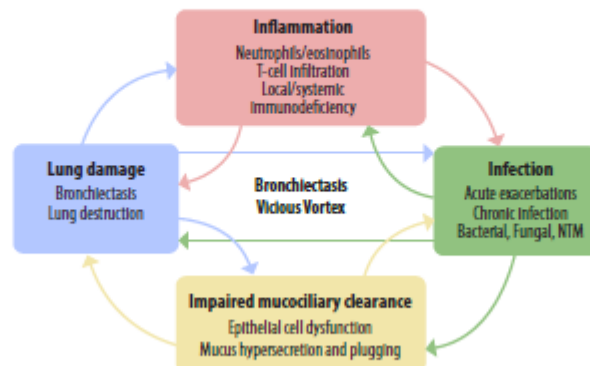
Bronchiectasis Severity Index BSI

SCORE	
1 Age	
☐ <50 (+0 pts) ☐ 50-59 (+2 pts) ☐ 70-79 (+4 pts) ☐ ≥80 (+6 pts)	
2 BMI	
☐ <18.5 (+2 pts) ☐ 18.5-25 (+0 pts) ☐ 26-29 (+0 pts) ☐ ≥30 (+0 pts)	
3 FEV ₁ % Predicted	
☐ >80 (+0 pts) ☐ 50-80 (+1 pt) ☐ 30-49 (+2 pts) ☐ <30 (+3 pts)	
4 Bronchiectasis hospitalizations over last two years	
☐ 0 (+0 pts) ☐ 1-2 (+0 pts) ☐ ≥3 (+2 pts)	
5 Number of exacerbations in previous year	
☐ 0 (+0 pts) ☐ 1-2 (+0 pts) ☐ ≥3 (+2 pts)	
6 mMRC Breathlessness Score	
☐ 0-2 (+0 pts) ☐ 3 (+2 pts) ☐ 4 (+3 pts)	
7 Pseudomonas Colonization	
☐ No (+0 pts) ☐ Yes (+1 pt)	
8 Colonization with other organisms	
☐ No (+0 pts) ☐ Yes (+1 pt)	
9 Radiological Severity	
☐ <3 lobes involved (+0 pts) ☐ ≥3 lobes involved or cystic bronchiectasis (+1 pt)	
Score 4-year risk of:	
Mild 0-4 0-5.3% 0-9.2%	
Moderate 5-8 4-11.3% 9.9-19.4%	
Severe ≥9 9.9-29.2% 41.2-80.4%	
TOTAL SCORE	

Chalmers JD, Goemine P, Albert S, McDonnell M, Lonn S, Davidson J, Poppeveld L, Salliwat P, Dugard L, Fardon T, De Souza A, Hill AL. The bronchiectasis severity index: An international derivation and validation study. *Am J Respir Crit Care Med*. 2014 Mar 1;189(5):576-85. doi: 10.1164/rccm.201309-1575OC. PMID: 24018936; PMCID: PMC3977711.

Bronchiectasis

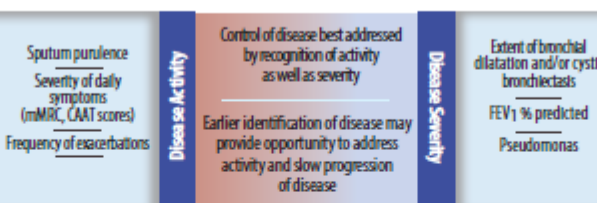
Bronchiectasis is a condition defined radiologically by abnormal dilatation and thickening of bronchial airways AND clinically by some combination of cough, sputum, exacerbations, dyspnea. Its course is often characterized by ongoing inflammation, infection, impaired mucociliary clearance and structural lung damage.



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Activity – Severity Relationship



For more educational support, connection, and resources, please contact us at:
www.BronchandNTM.org, 833-411-LUNG (5864), or contactus@bronchandntm.org.

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Bronchiectasis Pathway

STEP 1:

Diagnostic Evaluation

Imaging: HRCT | Symptoms: mMRC, CAAT, Exacerbations

STEP 2:

Data Collection

PFTs	Lab tests: CBC with diff, immunoglobulins, CRP, A1AT, ABPA	Microbiology: Sputum cultures (bacterial, fungal, mycobacterial)	Assess comorbidities and etiologies including CF variants and PCD
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STEP 3:

Determine Disease Severity, Disease Activity

High Disease Severity: • HRCT ≥3 lobes and/or cystic bronchiectasis • FEV ₁ <50% predicted	High Disease Activity: • ≥2 exacerbations/year or • Bronchiectasis hospitalization or • Symptoms: mMRC ≥4, CAAT ≥10	Determine Infection status: • Pseudomonas • NTM • Aspergillus
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STEP 4:

Establish Core Treatment Program

Airway Clearance: • Bronchodilator if indicated • Oscillatory PEP • Hypertonic saline, ACB/AD • Exercise/ Pulmonary Rehab • HFCWO	Treat Comorbidities: • COPD/Asthma • Chronic rhinosinusitis • GERD / aspiration • Autoimmune / rheumatologic • Immunodeficiency	Supportive Care: • Nutrition • Psychosocial support • Supplemental oxygen if needed • Vaccination • Smoking cessation
Infection Management: • Treat symptomatic infections • Pseudomonas, other bacterial/ fungal pathogens • NTM	Consider Anti-Inflammatory/Immunomodulatory therapy: • Macrolide (if no NTM and no prolongation of QTc) or DPP1 Inhibitor If problem tolerating a drug consider switching to other agent. If tolerating but limited response consider adding other agent. • Inhaled corticosteroids only in selected patients	

STEP 5:

Follow-up and Monitoring

Frequency of visits: • Unstable: every 3–6 months • Stable: every 6–12 months • or as clinically indicated	Assess: • Symptoms • Exacerbations • Adherence to airway clearance • Sputum cultures/ PFTs • Followup imaging	Adjust therapy based on response, tolerance, new symptoms, or exacerbations
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Suggested Considerations:
• Referral to clinical trials/ registries
• Surgical intervention for localized disease or hemoptysis
• Lung transplant evaluation
• Palliative care

HRCT—high resolution chest CT scan; A1AT—alpha-1 antitrypsin; ABPA—allergic bronchopulmonary aspergillosis; NTM—nontuberculous mycobacteriosis; CF—cystic fibrosis; PCD—primary ciliary dyskinesia; PEP—positive expiratory pressure; HFCWO—high frequency chest wall oscillation; CAAT—Chronic Airway Assessment Test; ACB—Active Cycle of Breathing; AD—Autogenic Drainage; DPP1—Dipeptidyl Peptidase 1 inhibitor

Bronchiectasis Pathway Card

Airway Clearance

A typical airway clearance routine may use one or more of the following:

Medications for Airway Clearance	Devices for Airway Clearance	Manual Techniques	Other Therapy
- Bronchodilators - Hypertonic Saline (3% or 7%) - Guafenesin* - Osmotics*	- Oscillatory Positive Expiratory Pressure (PEP) - High Frequency Chest Wall Oscillation - Cough Assisting Device	- Deep Cough - Huff Cough - Active Cycle of Breathing - Autogenic drainage - Chest Physical Therapy	- Hydration - Exercise - Pulmonary rehab - Postural Drainage

*There is limited data for the role of these medicines in airway clearance. Osmotics include mannitol and N-acetylcysteine (NAC).

Exacerbation

Diagnosis

Worsening symptoms that exceeds day-to-day variability and requiring a change in management. Symptoms include cough, sputum volume and/or consistency, sputum purulence, dyspnea and/or exercise tolerance, fatigue and/or malaise, hemoptysis.

Evaluation

Sputum for microbiology at onset of exacerbation before antibiotics started if possible.

Treatment

Antibiotics guided by previous microbiology results, generally 14-day course with shorter course for mild bronchiectasis, rapid clinical response, or pathogens more sensitive to antibiotics.
Airway clearance may need to be adjusted in frequency, intensity, and technique.

Frequent exacerbating or refractory patient

Comprehensive reassessment: microbiology including for bacteria, NTM, and fungal; imaging (e.g. CT scan); and review of potential "treatable traits" including comorbidities; airway clearance; mucociliary treatments; long-term (inhaled) antibiotics; anti-inflammatory options; long-term oxygen; pulmonary rehabilitation; and referral to specialty center if not already done.

Sputum Color Chart

Milder Disease Activity	Mucoid	Mucopurulent	Purulent	Purulent	More Severe Disease Activity
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Chronic Airways Assessment Test (CAAT)

I never cough	0 1 2 3 4 5	I cough all the time
I have no phlegm (mucus) in my chest	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 any activities at home
I am confident leaving my home despite my 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

Chronic Airways Assessment Test

TOTAL SCORE

• A CAAT score of 10 or more suggests significant symptoms.
• A change in CAAT score of at least 3-4 suggests a possible change in health status.
• A worsening CAAT score could be explained by an exacerbation, poor medication adherence, poor airway clearance techniques, or progression of bronchiectasis, COPD or other comorbid conditions.
• Download the form at <https://gaapp.org/caat-cat>

Nontuberculous Mycobacteria (NTM)

Diagnosis

(Specific to NTM PD: Diagnosis is based on all 3 criteria)
Clinical: compatible symptoms and exclusion of other diagnoses
Microbiologic: At least 2 positive sputum cultures with the same species/subspecies
Radiologic: compatible radiologic abnormalities

Microbiology

MAC and *M. abscessus* most common
M. avium complex (MAC) – 10 species, most common are *M. avium* and *M. intracellulare*
M. abscessus – 3 subspecies: *M. abscessus*, *M. bolletii*, *M. massiliense*

Drug susceptibility testing

MAC – test for macrolide and amikacin susceptibility
M. abscessus – test for CLS recommended antibiotics and inducible macrolide resistance

Treatment

• Initiation of treatment or "watchful waiting" dependent on benefit-risk assessment
 • Goals of care: Culture conversion versus improving symptoms versus slowing progression
 • Shared decision making is essential: acceptance, burden of treatment, goals of care
 • Early treatment may favor less intense medications and better tolerance
 • Risk factors for progression: fibrocavitary (FC) vs nodular bronchiectatic (NB), age, low BMI (<18.5), increased inflammatory markers (CRP, ESR), low albumin, male sex
 • Severity factors: FC versus NB disease, multi-lobar, AFB smear positivity, presence of co-morbidities

Treatment of MAC (dosing available on app)

• Azithromycin, ethambutol, rifampin • Nodular bronchiectatic: LLW dosing versus fibrocavitary: QID dosing plus LLW IV amikacin

Refractory or Recurrent MAC NTMPD

• Refractory defined as remaining sputum culture positive after at least 6 months of guideline-based therapy
 • Treatment: Assess adherence to the treatment regimen, obtain repeat drug susceptibility test results, consider determination of serum drug concentrations, add amikacin liposome inhalation (ALIS) suspension to regimen, consider addition of another drug, and consider surgical resection
 • Referral: Consider referral to specialized center of NTMPD care

Macrolide Resistant MAC NTMPD

Referral to a specialized center of NTMPD care

Treatment of *M. abscessus* (dosing available on app)

IV medications: amikacin, imipenem or cefepime, linezolid
 Oral: azithromycin, bedaquiline, doxiflamine, linezolid or tedizolid, omadacycline
 Macrolide resistant: Initial Phase: 2-3 IV drugs, 2-3 oral drugs
 Continuation Phase: 2-3 oral drugs
 Macrolide susceptible: Initial Phase: 1-2 IV drugs, 2 oral drugs
 Continuation Phase: 2-3 oral drugs

Monitoring on Treatment

• Treatment response: Sputum cultures every 1-2 months, low dose chest CT or other imaging at 3-6 months and then every 6-12 months and end of treatment, CRP/ESR if elevated at baseline
 • Adverse drug reactions: CBC, CMP at baseline and every 1-3 months, visual acuity and red/green color discrimination at baseline and every 2-3 months, audiogram at baseline and every 2-3 months in people receiving an aminoglycoside, EKG at baseline and every 3-6 months in people receiving a macrolide, doxiflamine, or bedaquiline
 • Monitoring to be done sooner in event of new symptoms or concerns

Duration of Treatment

Dependent on goals of care, generally 12 months after sputum culture conversion

Referral

Consider referral to a specialized center for: refractory MAC, recurrent MAC, macrolide resistant MAC, *M. abscessus* (especially if macrolide resistant), consideration of surgical intervention, development of medication intolerance, uncertain goals of care, refractory co-morbidities.

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Cite this article as: Murray MP, Portland JL, Turnbull K, et al. Sputum colour: a useful clinical tool in non-cystic fibrosis bronchiectasis. *Eur Respir J* 2009; 34: 361-364 [DOI: 10.1183/09031536.00163209]

Objective - Bronchiectasis

- Understand the pathophysiology and epidemiology
- Bronchiectasis Pathway
 - When to Suspect Bronchiectasis – signs and symptoms
 - Diagnostic Workup, Data Collection, Disease Severity, Core Treatment, and Follow-up/Monitoring
 - Non-tuberculosis Mycobacterial Pulmonary Disease (NTM)
 - Respiratory Therapists' Role in Bronchiectasis Care
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- Summary and Q&A

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What is Bronchiectasis?

Bronchiectasis

Bronchiectasis is a condition defined **radiologically** by abnormal dilatation and thickening of bronchial airways AND **clinically** by some combination of cough, sputum, exacerbations, dyspnea. Its course is often characterized by ongoing inflammation, infection, impaired mucociliary clearance and structural lung damage.

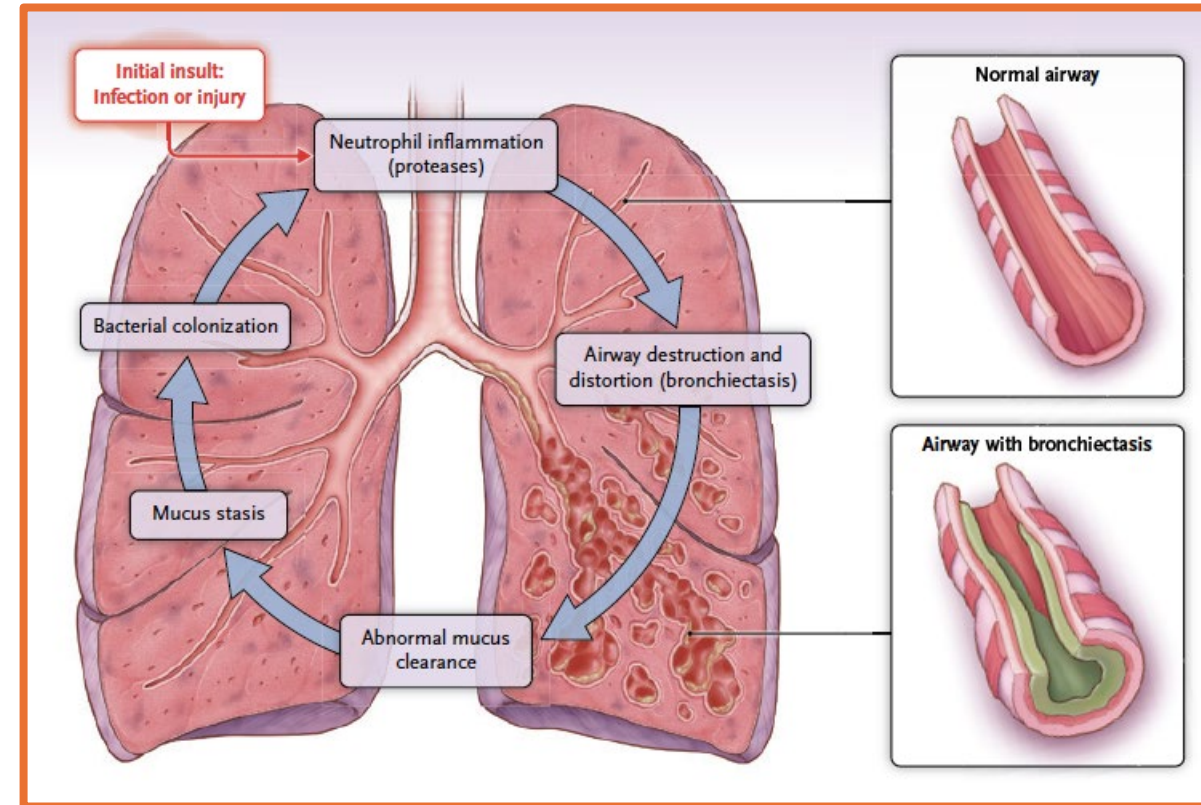


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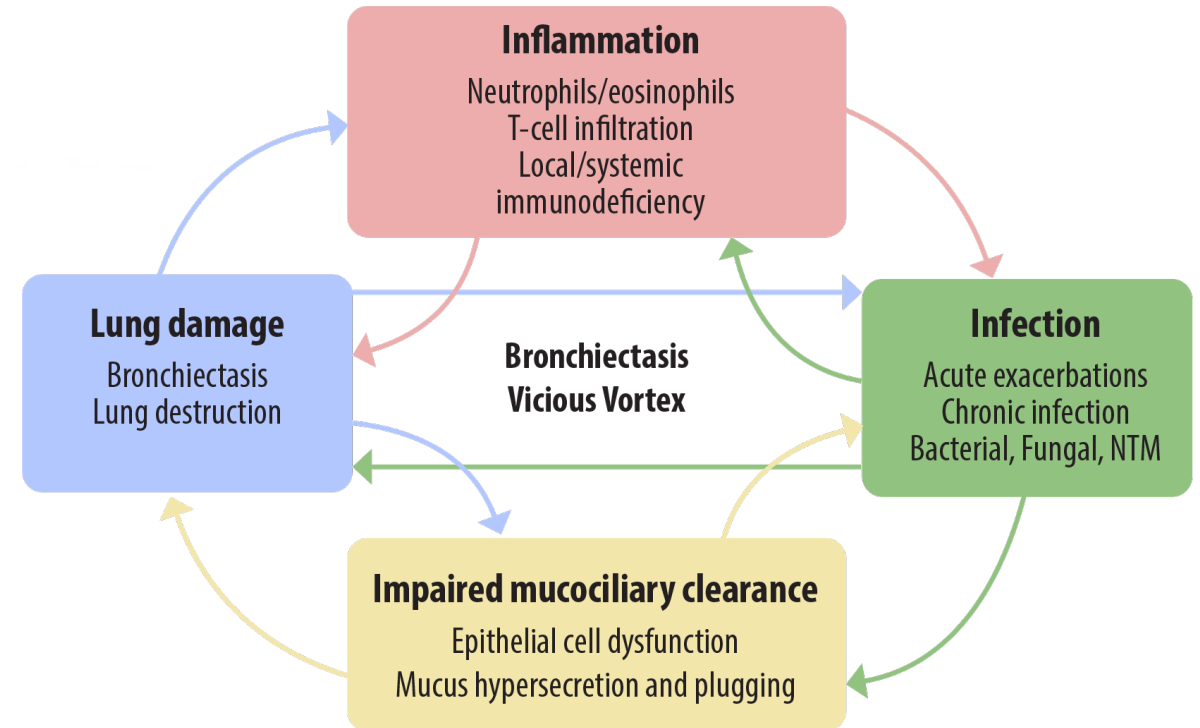
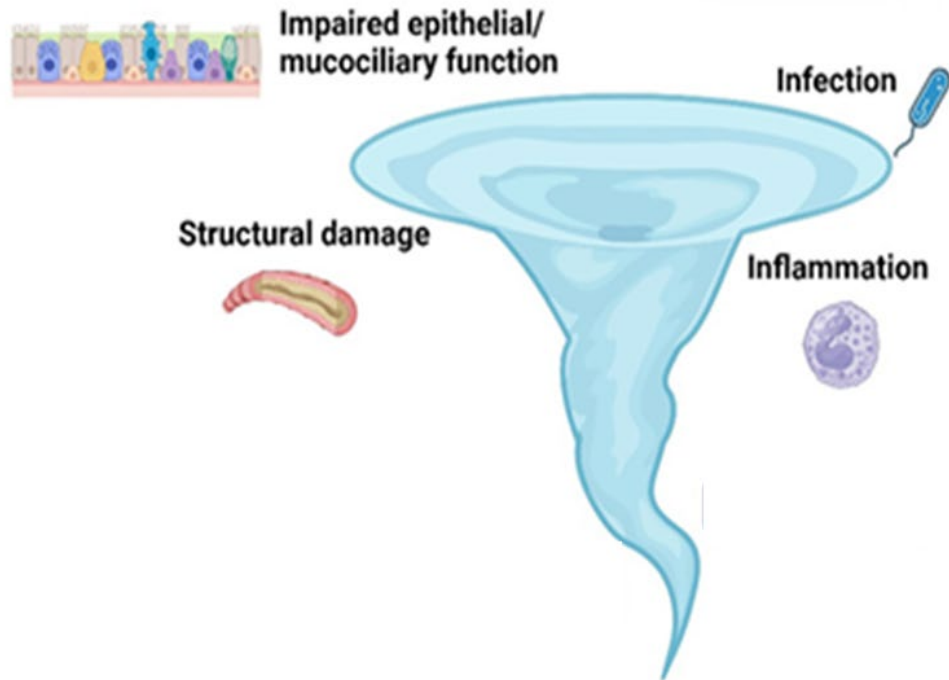
What is Bronchiectasis?

Etymology: Greek,

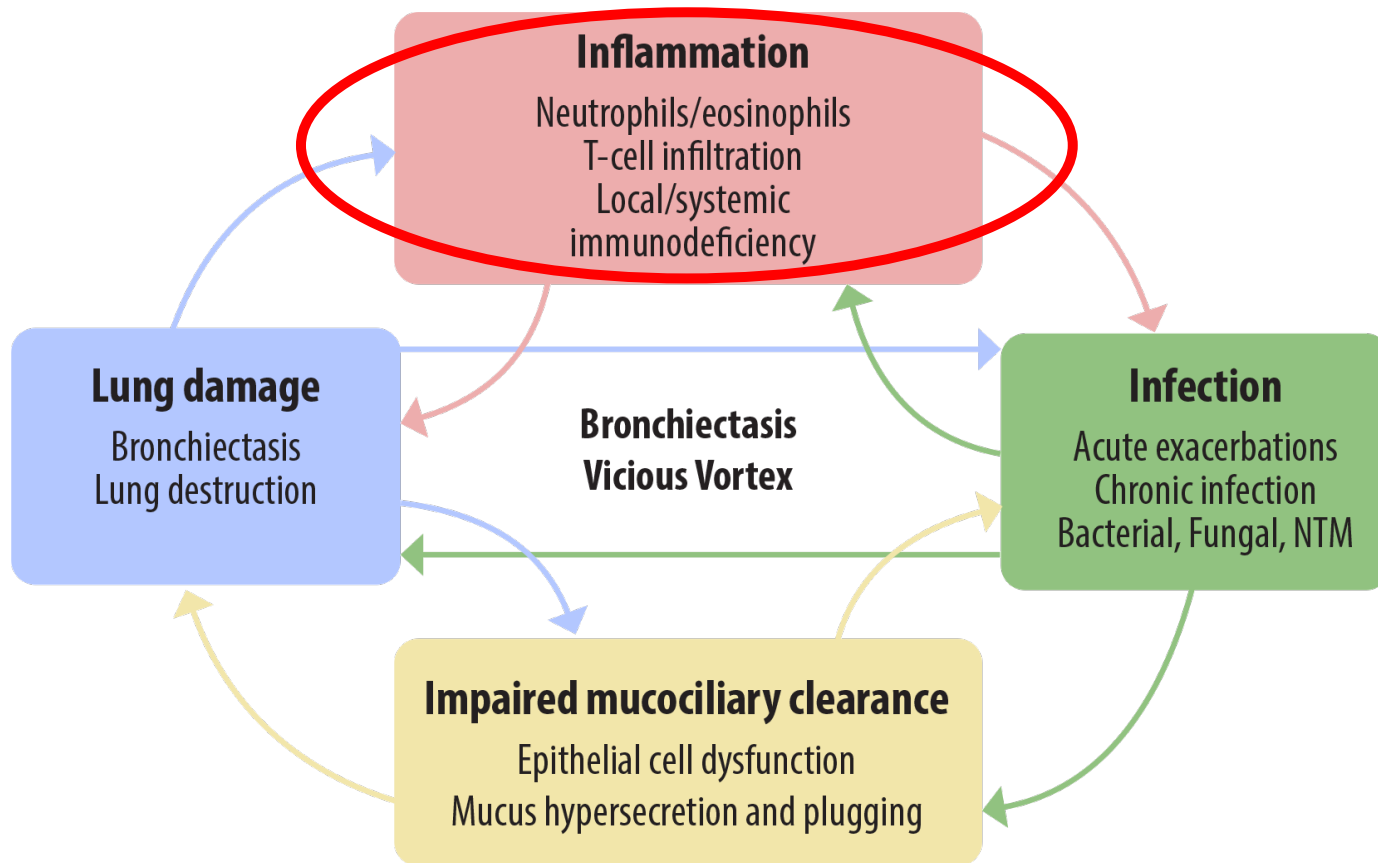
- Bronchi- (*bronkhia*): bronchial tubes
- -ectasis (*ektasis*): dilation



Bronchiectasis Pathogenesis

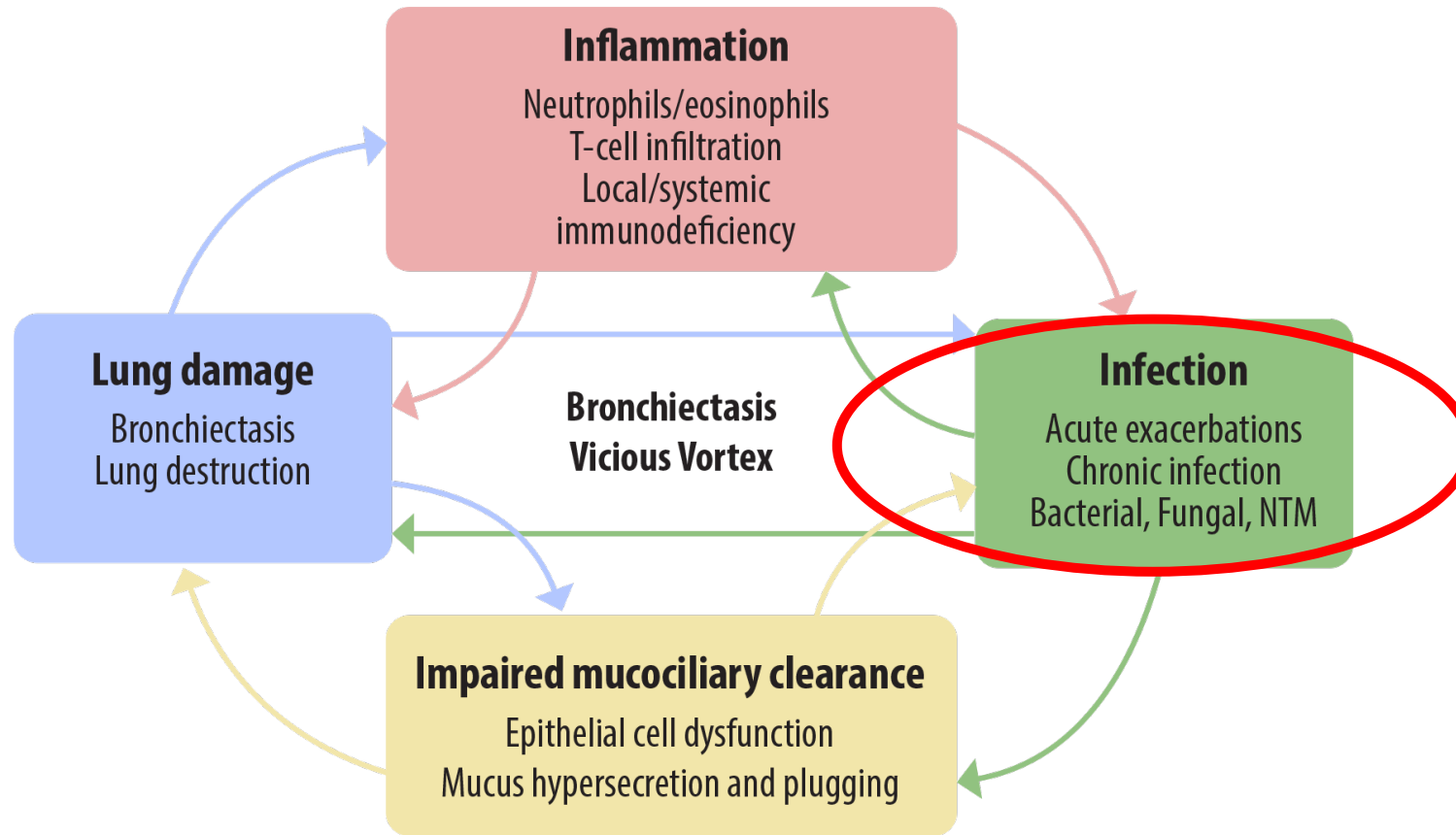


Vicious Vortex- Inflammation



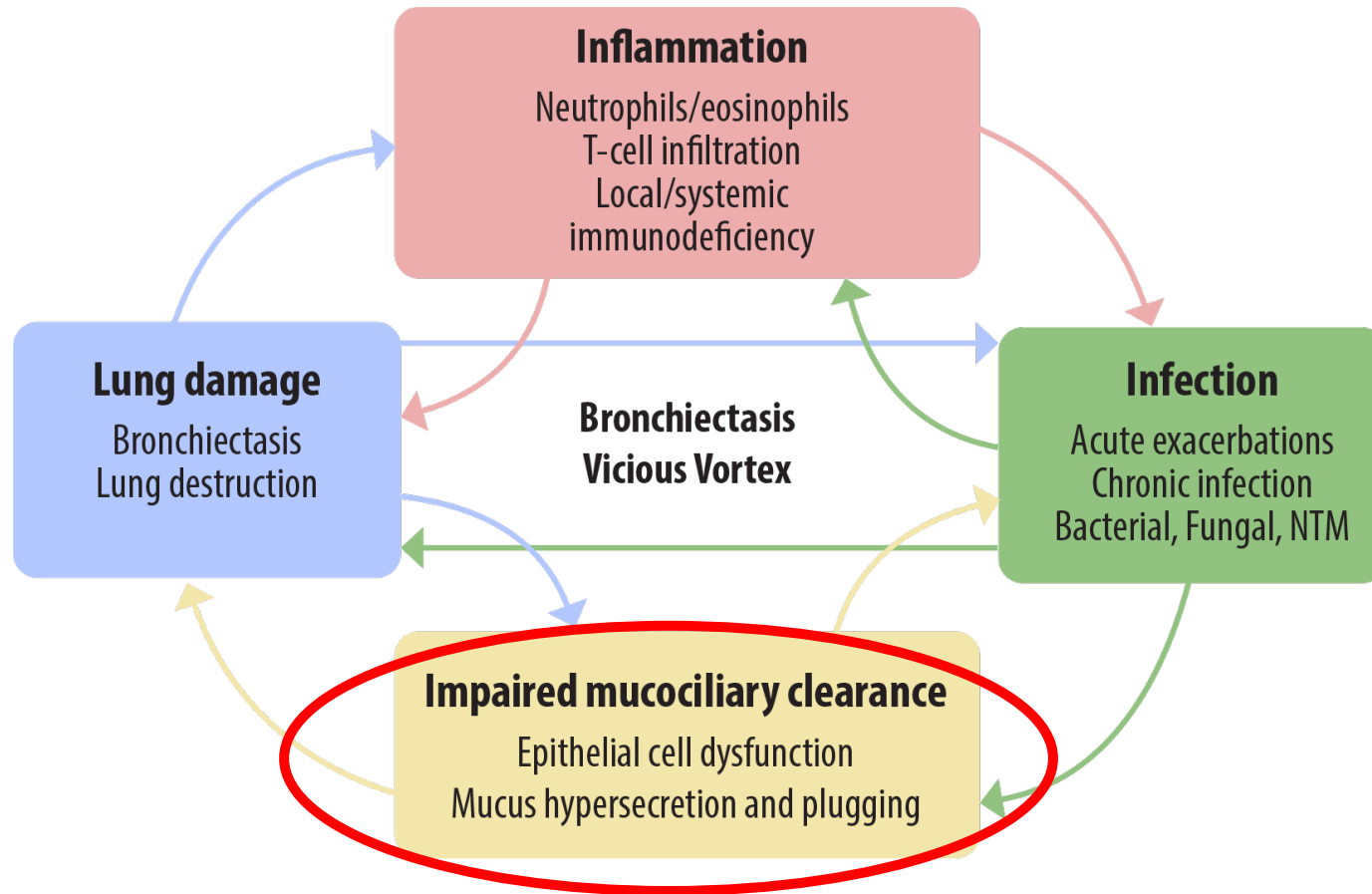
- The body's natural response to injury including infection is inflammation
 - Neutrophilic - predominant
 - Eosinophilic, 20%
- Inflammation leads to thickening of the walls of the airways and increased mucus production.

Vicious Vortex- Infection



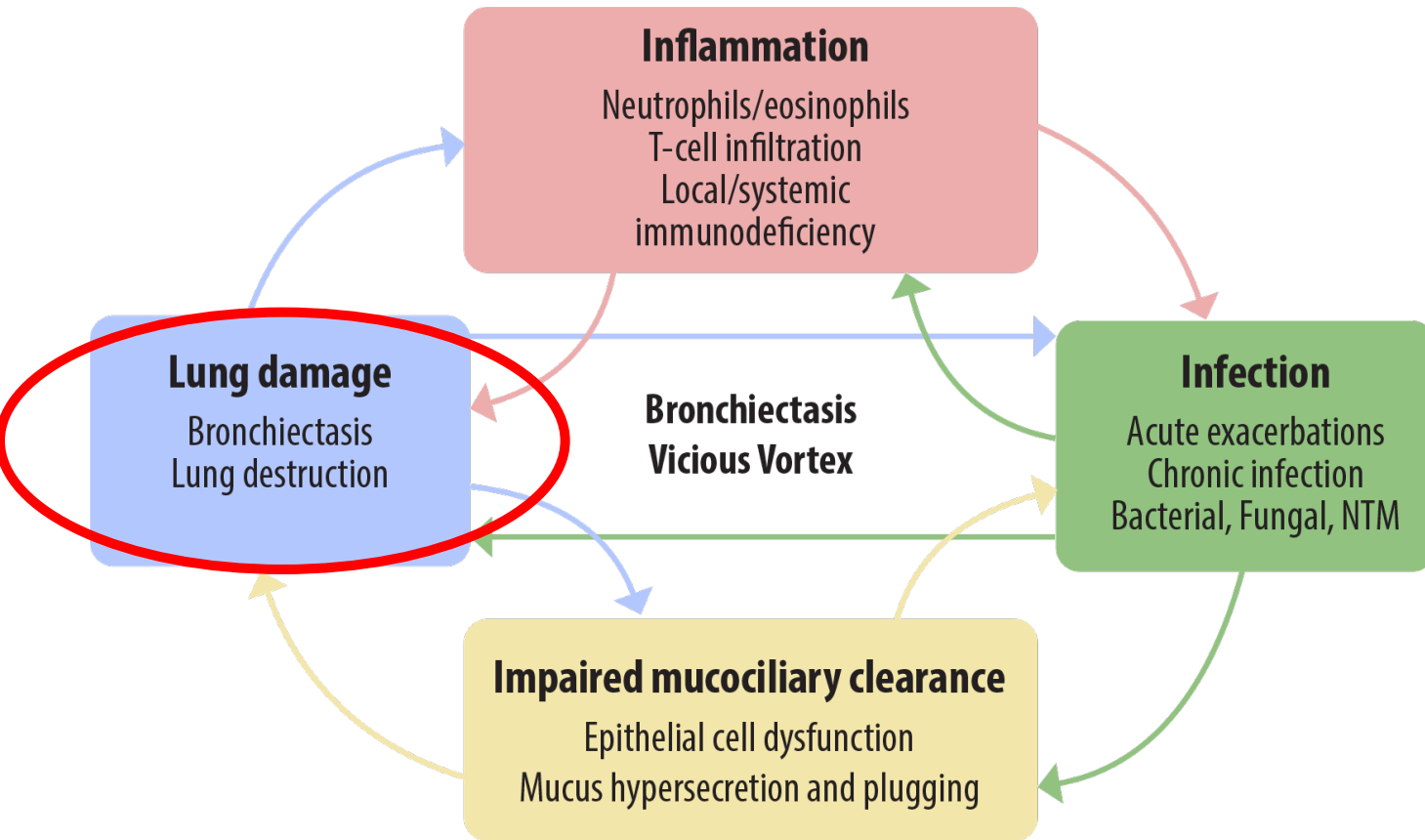
- Retained thickened mucus favors infection from many pathogens – bacteria, fungal, NTM

Vicious Vortex- Impaired Mucociliary Clearance



- Creates a favorable environment for changes leading to persistent infection and inflammation.

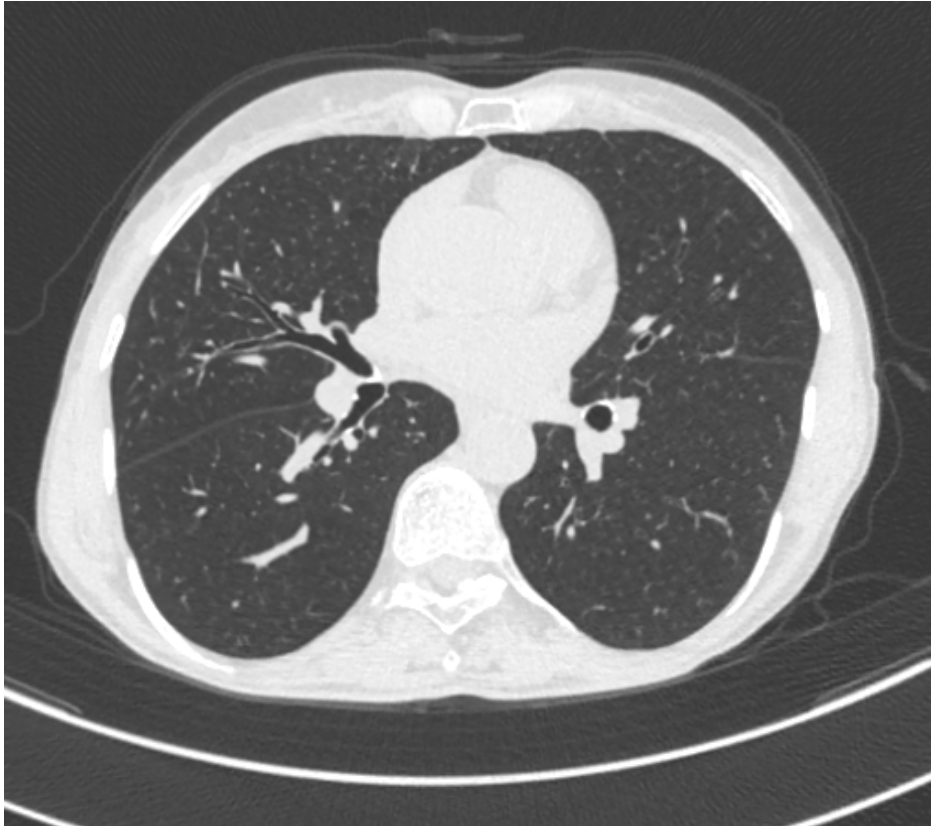
Vicious Vortex- Lung Damage



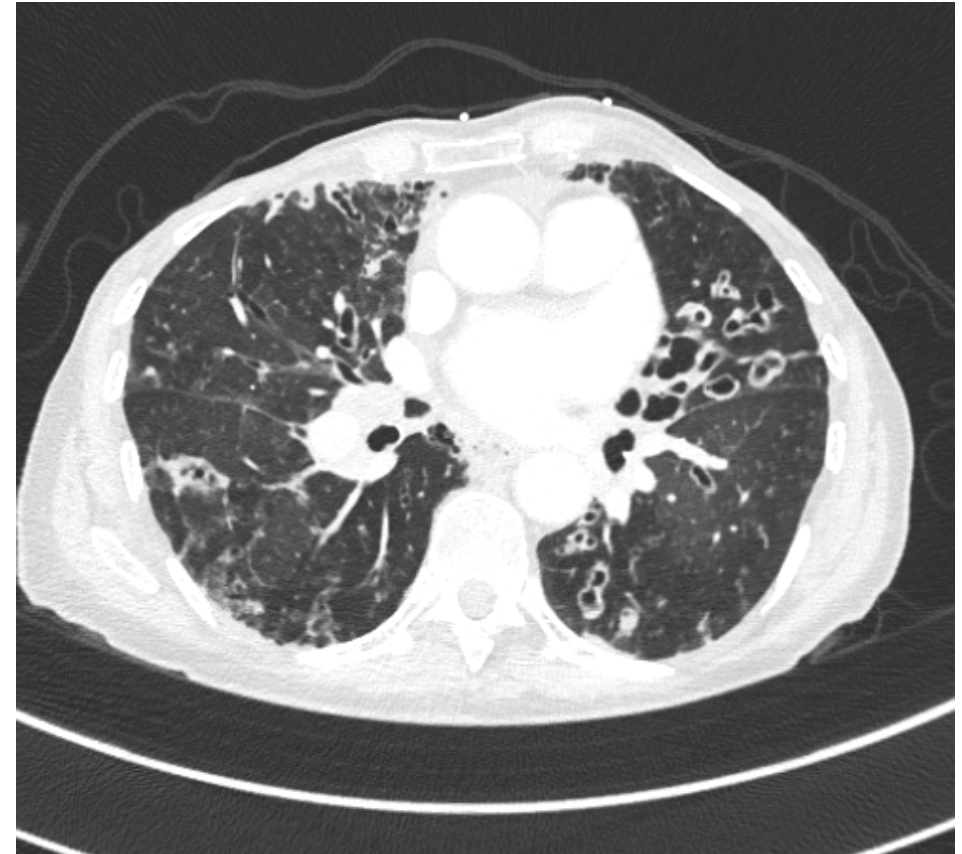
- Infection and inflammation increase lung damage
 - Bronchial dilatation
 - Bronchial wall thickening

Spectrum of Disease Varies

Patient 1



Patient 2



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Epidemiology and Burden of Disease

- An estimated 350,000 to 500,000 adults are affected by bronchiectasis in the United States.
- Increases of 8% per year
- More common in women than men
- The prevalence increases significantly with age

Management Costs of BE

- Two US studies reported total annual costs (2001-2016) of approximately US\$26,000 in patients without exacerbations, increasing to US\$36,000–37,000 in patients with exacerbations.
- *P. aeruginosa* infection increased management costs by US\$31,551 to US\$56,499, as reported in two US studies, with hospitalization being the main cost driver.

Seitz AE, et al. *Chest*. 2012;142:432.
 Weycker D, et al. *Chron Respir Dis*. 2017;14:377
 Goeminne, et al. *BMC Pulm Med*. 2019;19:54

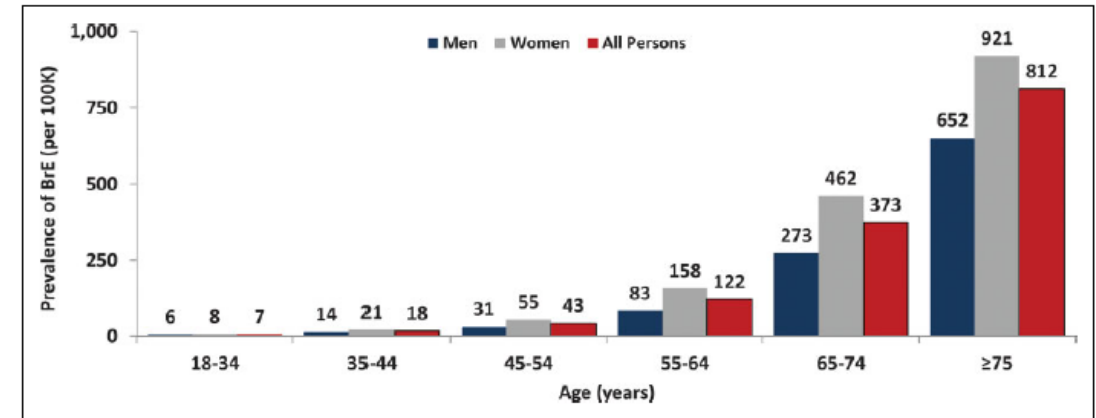
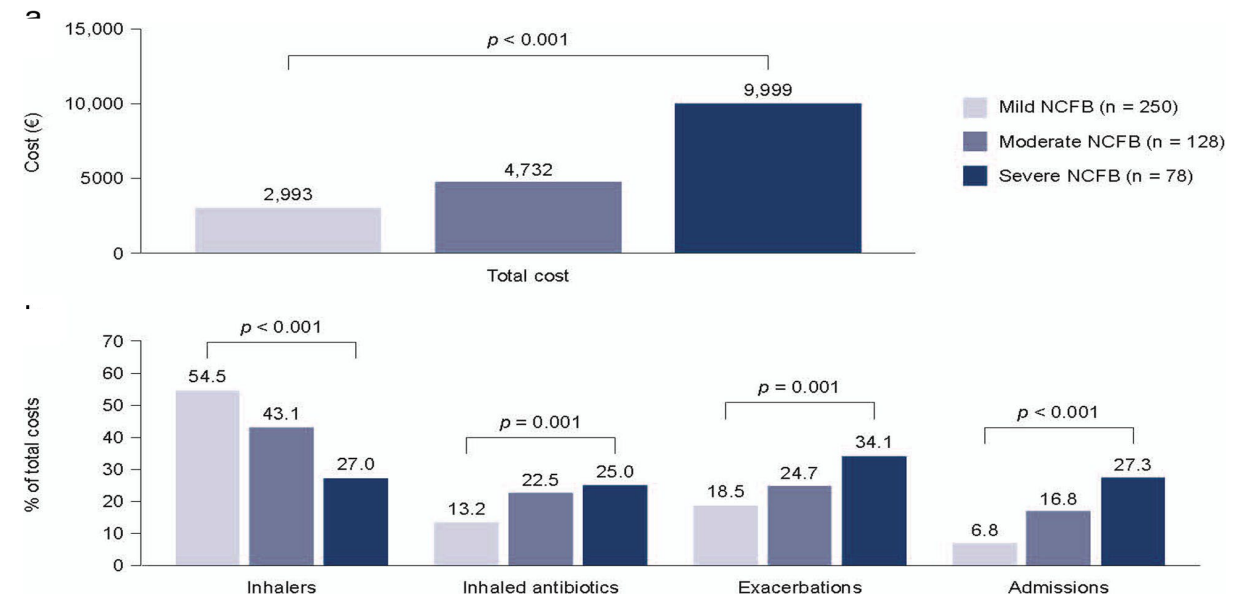


Figure 2. Prevalence of bronchiectasis among US adults, by age and sex.



What Is the Health Care Resource Utilization and Economic Burden of Bronchiectasis in Adults and Children?

STUDY DESIGN

Systematic review of published studies of economic burden and health care utilization in adults and children with bronchiectasis between 2001 to 2022

597 publications identified



53 included

RESULTS



Total annual health care costs

\$3,579 to \$82,545

*Driven by hospitalization costs



Indirect costs
(lost income due to illness)
\$1,311 to \$2,898



\$23,687

Indirect costs
Missed 12 school days/year



Aggregate annual health care costs (in US dollars)

USA	\$14.68 billion/year
United Kingdom	\$1.63 billion/year
Spain	\$1.34 billion/year
South Korea	\$981.03 million/year
Germany	\$740.30 million/year
Singapore	\$101.60 million/year
Australia	\$17.77 million/year

There is substantial economic burden of bronchiectasis for patients and health care systems, but there is a notable absence of data regarding the impact in children and economically disadvantaged communities.

Associated Conditions and Co-morbidities - Heterogeneity

- Up to 40% idiopathic
- Infection- related
 - Bacterial
 - Mycobacterial (NTM – nontuberculous mycobacteria or TB – tuberculosis)
 - Fungal
 - Viral
- Congenital or Acquired
 - Congenital/genetic- Cystic Fibrosis (CF), Primary Ciliary Dyskinesia (PCD), Alpha-1 Antitrypsin Deficiency
 - Pulmonary disease- e.g. COPD, asthma (overlap syndromes)
 - Altered immune response - Immunodeficiency
 - Inflammatory disease - e.g. Autoimmune, Inflammatory bowel disease (IBD)
 - GERD
 - Chronic rhinosinusitis (CRS)

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When to Suspect Bronchiectasis- Symptoms

Symptoms

- Cough with sputum production
- Shortness of Breath
- Fatigue
- Chest pain
- Fever
- Hemoptysis
- Weight loss



When to Suspect Bronchiectasis- Red Flags

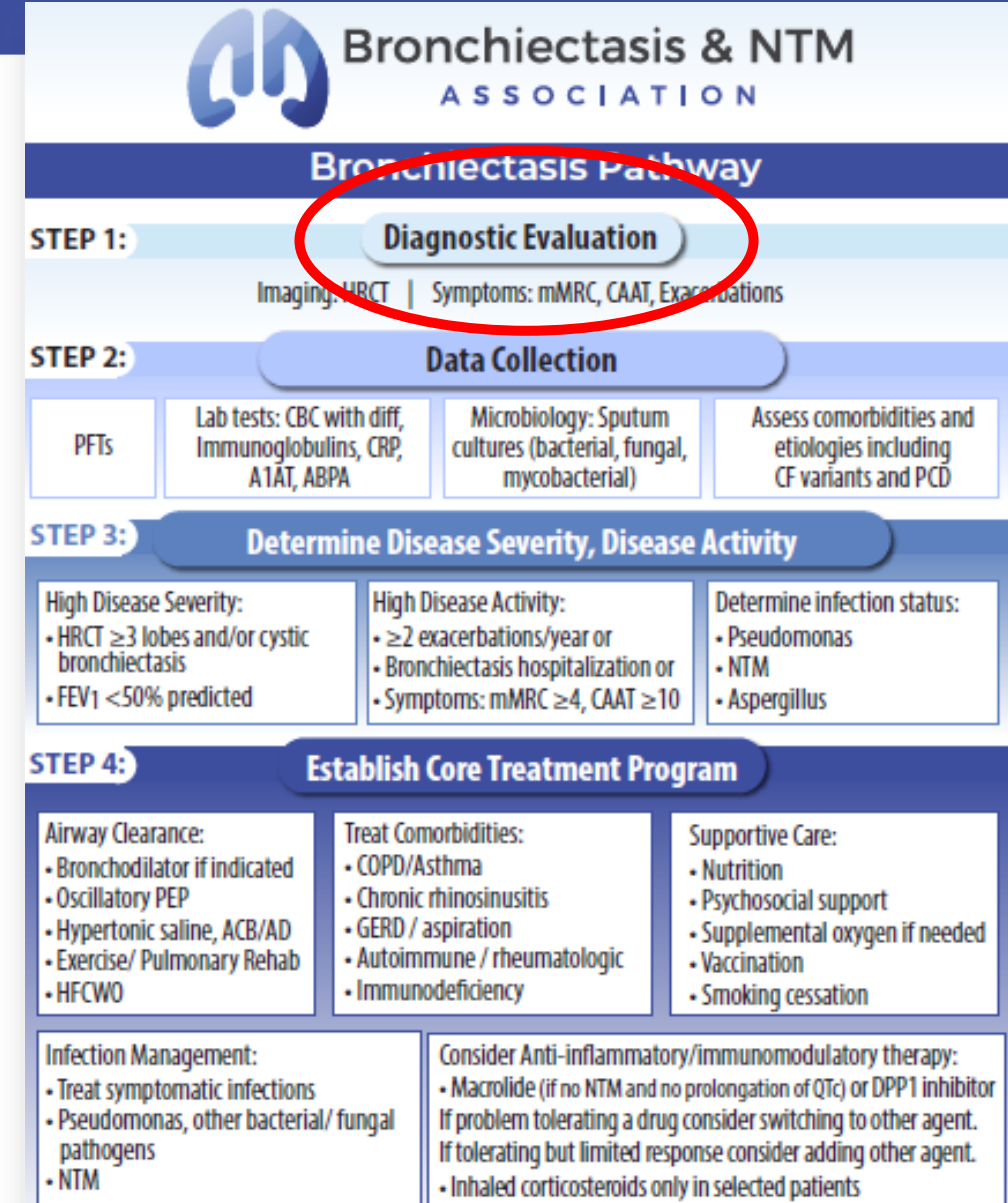
Red Flags

- Frequent antibiotic use for respiratory infections (≥ 2 per year)
- Isolation of pseudomonas or nontuberculous mycobacteria (NTM, e.g., MAC) in sputum or respiratory cultures
- Refractory symptoms associated with a diagnosis of asthma, COPD, or the presence of both conditions.
- Non-resolving associated (respiratory) symptoms



Diagnostic Evaluation

- Imaging – Chest CT
- Modified Medical Research Council (mMRC)
- Chronic Airway Assessment Test (CAAT)
- Exacerbation - assessment

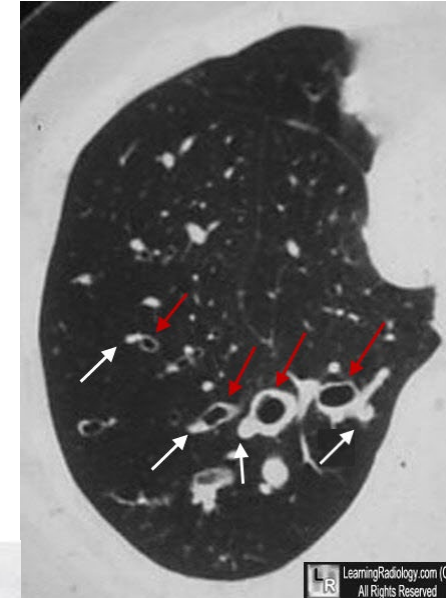
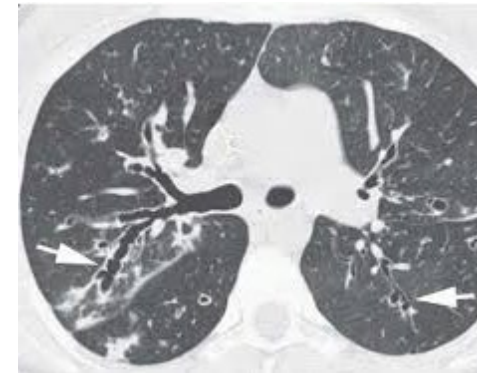


Diagnostic Evaluation - Imaging

- **Imaging**

- Gold Standard: High-Resolution CT (HRCT)
- On HRCT, does the patient have one or more of the following?
 - Inner airway-to-artery diameter ratio ≥ 1
 - Outer airway-to-artery diameter ratio ≥ 1
 - Lack of normal airway tapering
 - Visible airways extending into the lung periphery

- mMRC
- CAAT
- Exacerbations



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Diagnostic Evaluation - mMRC Breathlessness Scale

- Imaging
- **modified Medical Research Council (mMRC) scale**
 - Simple 0–4 grade questionnaire
 - Breathlessness based on how it limits daily activities
 - Higher mMRC scores are generally associated with:
 - More frequent exacerbations
 - Worse lung function (e.g., lower FEV₁, higher RV/TLC, lower DLCO)
 - Greater radiologic extent/severity
 - Poorer quality of life
 - mMRC helps clinicians:
 - Identify patients needing more intensive treatment (airway clearance, pulmonary rehab, oxygen assessment, etc.)
 - Track response to interventions over time

- CAAT
- Exacerbations

Stenton C. *Occup Med* 2008; 58, 226
Nucci M et al. *J Bras Pneumol*. 2020; 46, e20190162

mMRC Breathlessness Scale	
Grade	Description of Breathlessness
①	I only get breathless with strenuous exercise
②	I get short of breath when hurrying on level ground or walking up a slight hill
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Chris Stenton. The mMRC breathlessness scale. *Occup Med (Lond)* (2008)58(3): 226-227 doi:10.1093/occmed/kqm162, Table 1.
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Diagnostic Evaluation - CAAT

- Imaging
- mMRC
- **Chronic Airways Assessment Test (CAAT)**
 - Assesses: cough, sputum, breathlessness, chest tightness, activity limitation, sleep, and energy, giving a total score from 0–40.
 - Higher CAAT scores are generally associated with:
 - More severe dyspnea (mMRC)
 - Poorer lung function
 - More extensive radiologic disease
 - Greater systemic inflammation.
- Exacerbations

Wang J. et al. *ERJ Open Res* 2024; 10, 00867-2023
Finch S. et al. *CHEST* 2020; 157, 815
De la Rosa D. et al. *CHEST* 2020; 157, 824
McShane P and Aksamit T. *CHEST* 2020;157, 749

Chronic Airways Assessment Test (CAAT)

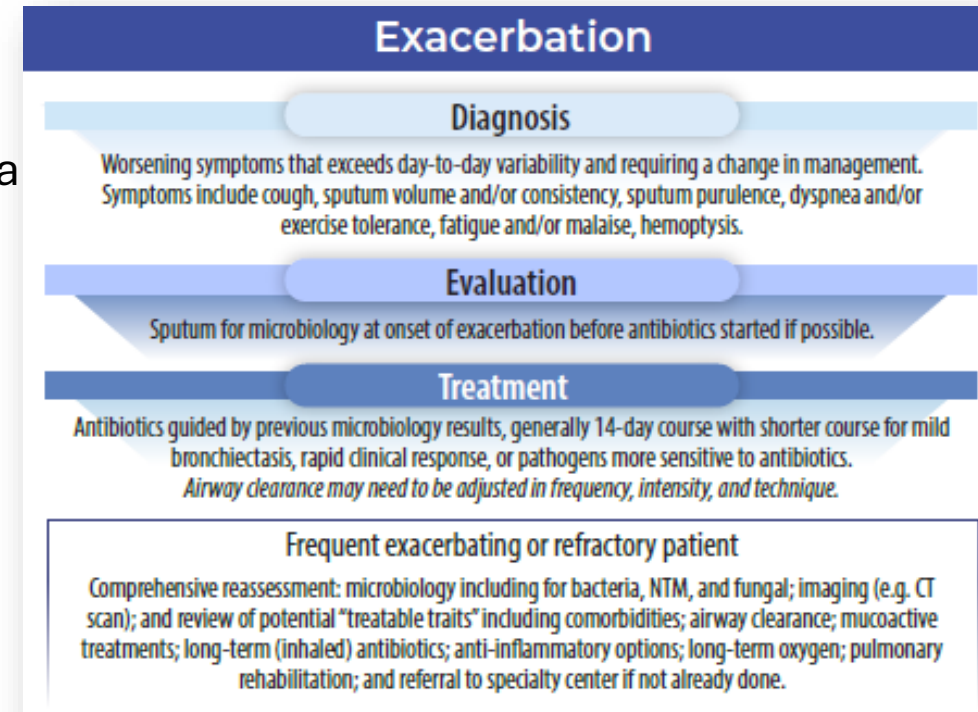
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I have lots of energy	0 1 2 3 4 5	I have no energy at all	
 TOTAL SCORE			

- A CAAT score of 10 or more suggests significant symptoms.
- A change in CAAT score of at least 3-4 suggests a possible change in health status.
- A worsening CAAT score could be explained by an exacerbation, poor medication adherence, poor airway clearance techniques, or progression of bronchiectasis, COPD or other comorbid conditions.
- Download the form at <https://gaapp.org/caat-cat>

Diagnostic Evaluation - Exacerbations

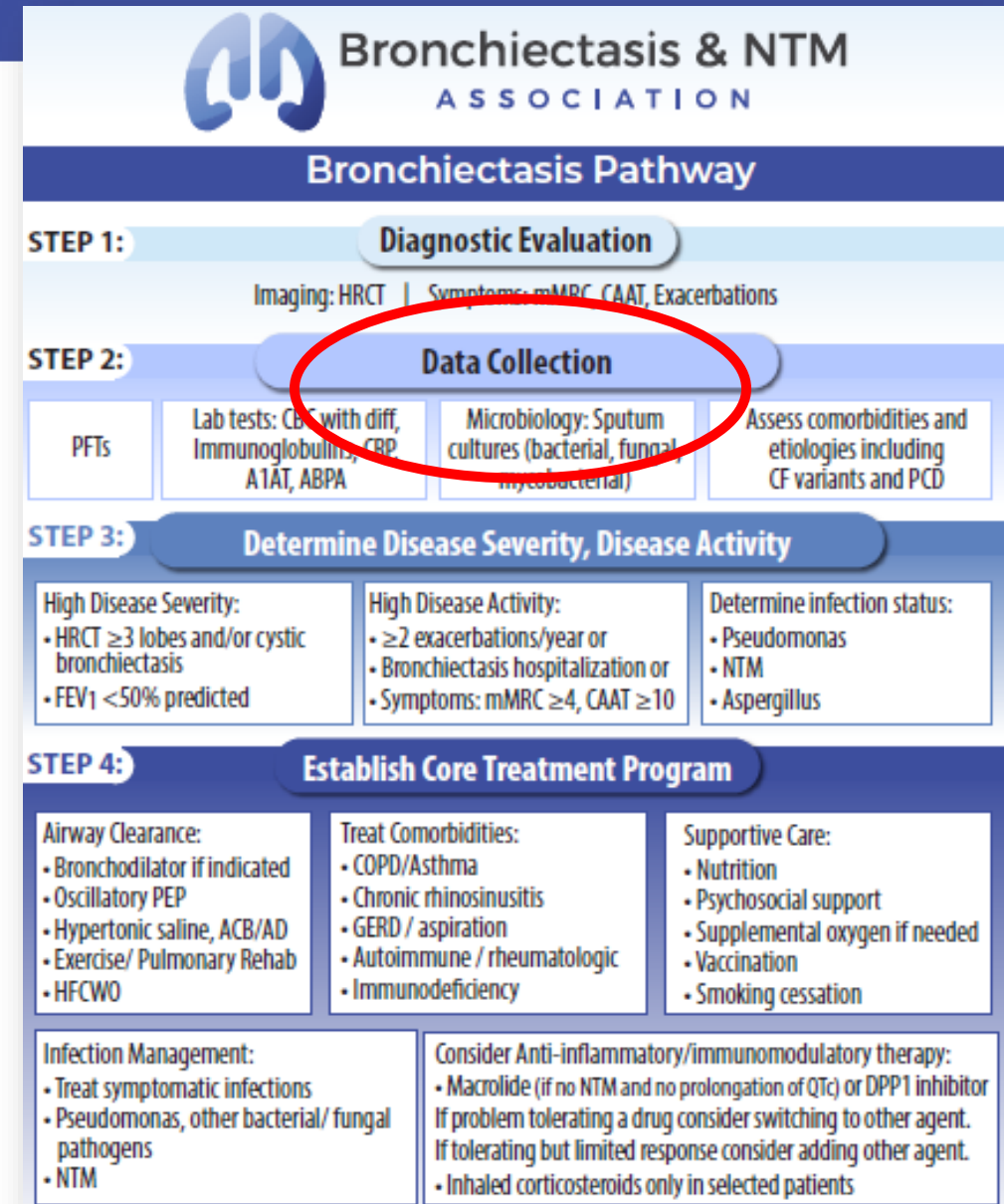
- Imaging
- mMRC
- CAAT
- **Exacerbations:**
 - Worsening of 3 or more symptoms within 48 hours and requiring a change in treatment.
 - Clinical Warning Signs:
 - Increased cough frequency or intensity
 - Change in sputum amount, thickness, or color/purulence
 - Worsening dyspnea on exertion or at rest
 - Reduced exercise tolerance or increased fatigue
 - New or worsened hemoptysis
 - Clinical Impact
 - Faster lung function decline
 - Worse health-related quality of life
 - Increased hospitalizations and health care use

Early recognition and prompt intervention are essential to improving outcomes.



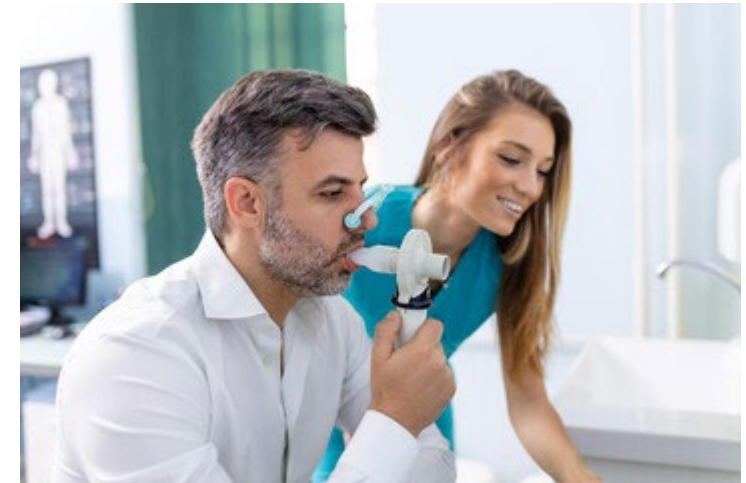
Data Collection

- Pulmonary Function Testing (PFT)
- Laboratory Tests
 - Blood work
 - Genetics
- Microbiology
 - Bacterial, fungal, NTM
- Assess comorbidities and etiologies



Data Collection - Pulmonary Function Test

- **Pulmonary function testing (PFT)**
 - Common patterns: obstruction (most frequent), restrictive, mixed, and normal
 - Lower pulmonary function
 - Increased disease severity
 - Increased risk of exacerbations and hospitalization
 - Bronchodilator maybe helpful on case-by-case basis
 - Inhaled corticosteroids only for select patients – asthma, COPD
- Laboratory tests
- Microbiology
- Assess comorbidities



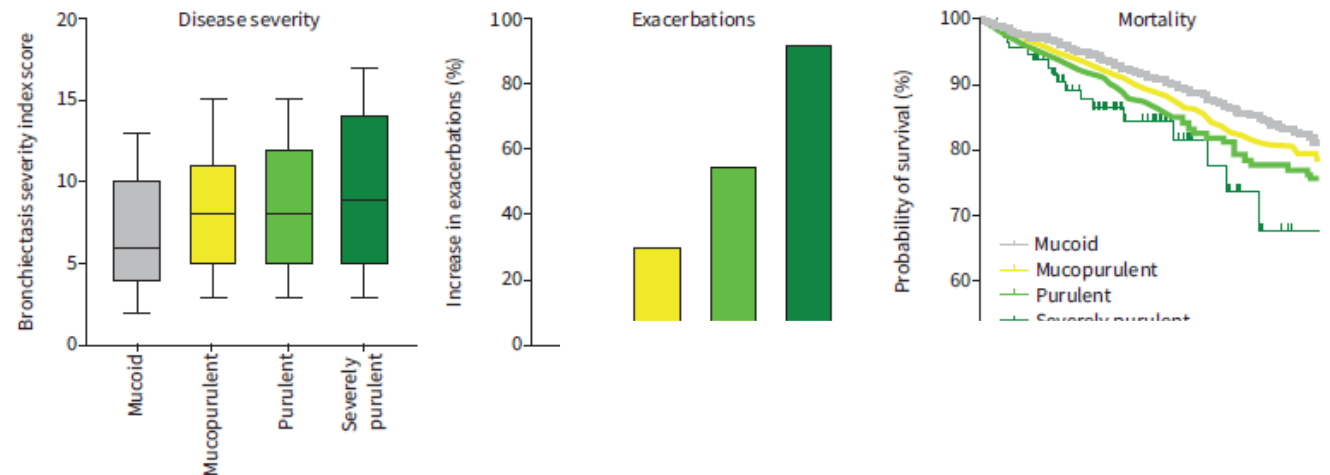
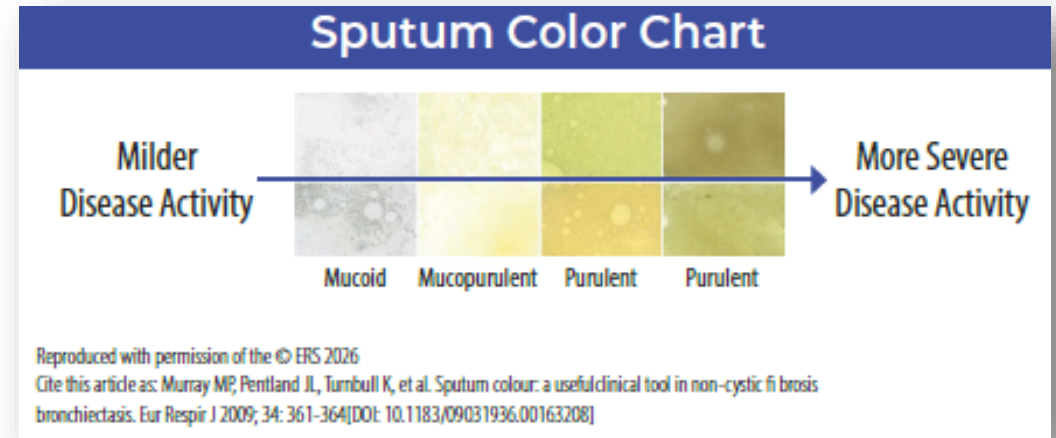
Data Collection - Laboratory Tests

- Pulmonary function testing (PFT)
- **Laboratory tests**
 - CBC with differential
 - Immunoglobulins
 - C-reactive Protein (CRP)
 - Alpha-1 antitrypsin (A1AT)
 - Allergic Bronchopulmonary Aspergillosis (ABPA)
- Microbiology
- Assess comorbidities



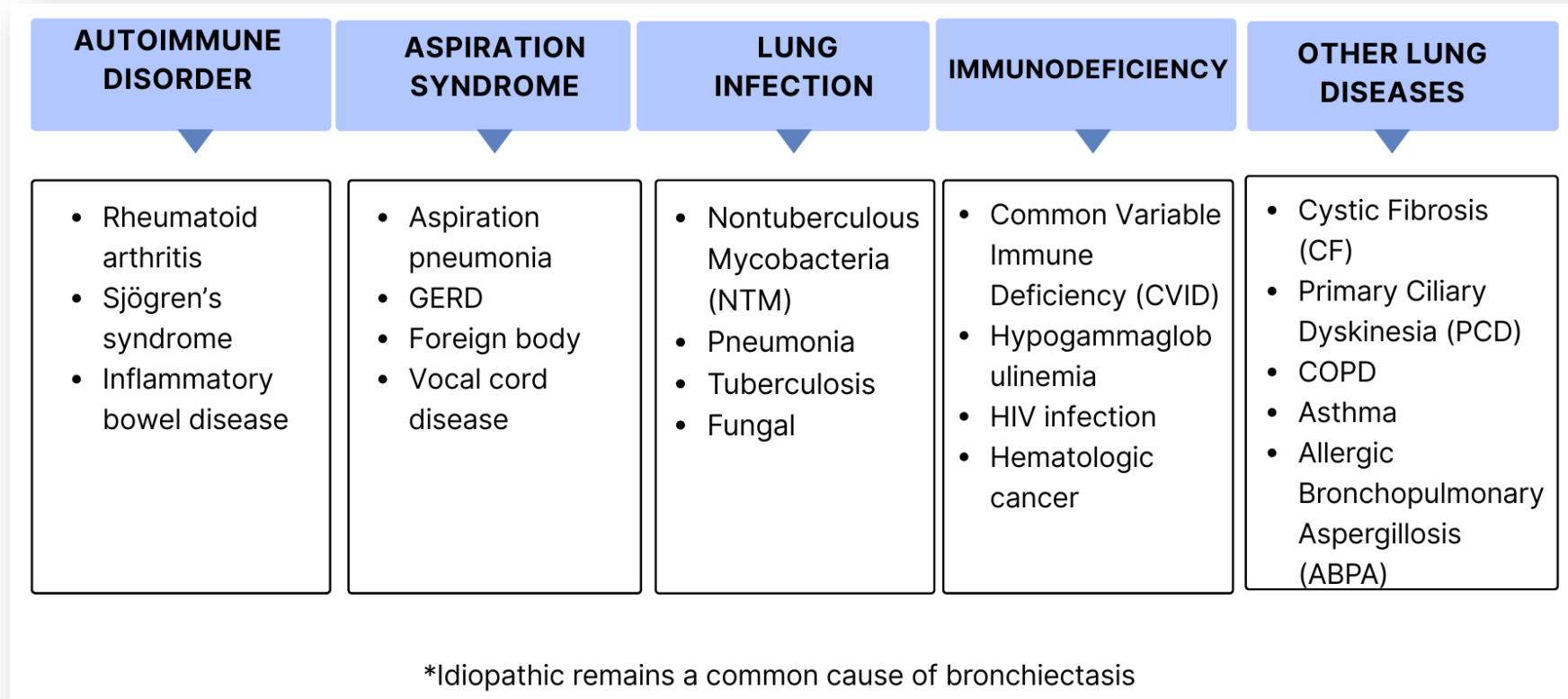
Data Collection - Microbiology

- Pulmonary function testing (PFT)
- Laboratory tests
- **Microbiology**
 - Sputum
 - Darker, more purulent sputum:
 - Lower FEV₁
 - Worse quality of life
 - More bacterial infection
 - Higher bronchiectasis severity index - BSI
 - Bacterial cultures
 - Acid-Fast Bacillus (AFB) cultures – mycobacterial
 - Fungal cultures
- Assess comorbidities



Data Collection - Associated Conditions and Comorbidities

- Pulmonary function testing (PFT)
- Laboratory tests
- Microbiology
- **Assess associated conditions and comorbidities:**

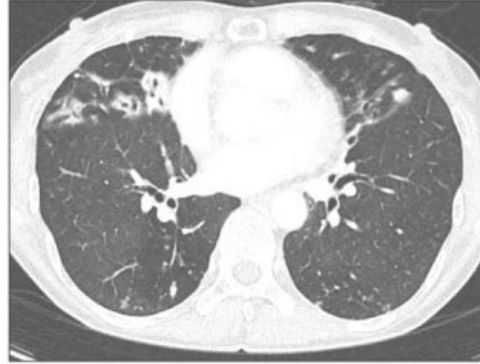


Disease Activity versus Disease Severity

(A) High disease severity and low disease activity



(B) Low disease severity and high disease activity



Activity – Severity Relationship

Disease Activity	Sputum purulence Severity of daily symptoms (mMRC, CAAT scores) Frequency of exacerbations	Disease Severity	Extent of bronchial dilatation and/or cystic bronchiectasis FEV1 % predicted Pseudomonas
	Control of disease best addressed by recognition of activity as well as severity Earlier identification of disease may provide opportunity to address activity and slow progression of disease		

Bronchiectasis Severity Index (BSI)

- Bronchiectasis Severity Index (BSI)
 - Strong predictor of 1–4 year morbidity and mortality
 - Combines:
 - Clinical features
 - Radiological findings
 - Microbiological results
 - Predicts:
 - Hospital admissions
 - Exacerbations
 - Quality of life
- Activity- Severity Index

Bronchiectasis Severity Index BSI

	SCORE
1 Age ☐ <50 (+0 pts) ☐ 50-69 (+2 pts) ☐ 70-79 (+4 pts) ☐ ≥80 (+6 pts)	_____
2 BMI ☐ <18.5 (+2 pts) ☐ 18.5-25 (+0 pts) ☐ 26-29 (+0 pts) ☐ ≥30 (+0 pts)	_____
3 FEV₁ % Predicted ☐ >80 (+0 pts) ☐ 50-80 (+1 pts) ☐ 30-49 (+2 pts) ☐ <30 (+3 pts)	_____
4 Bronchiectasis hospitalizations over last two years ☐ No (+0 pts) ☐ Yes (+5 pts)	_____
5 Number of exacerbations in previous year ☐ 0 (+0 pts) ☐ 1-2 (+0 pts) ☐ ≥3 (+2 pts)	_____
6 mMRC Breathlessness Score ☐ 0-2 (+0 pts) ☐ 3 (+2 pts) ☐ 4 (+3 pts)	_____
7 Pseudomonas Colonization ☐ No (+0 pts) ☐ Yes (+3 pts)	_____
8 Colonization with other organisms ☐ No (+0 pts) ☐ Yes (+1 pts)	_____
9 Radiological Severity ☐ <3 lobes involved (+0 pts) ☐ ≥3 lobes involved or cystic bronchiectasis (+1 pts)	_____
Score-4 year risk of:	TOTAL SCORE _____
Mild 0-4	Mortality 0-5.3% Hospitalization 0-9.2%
Moderate 5-8	4-11.3% 9.9-19.4%
Severe ≥9	9.9-29.2% 41.2-80.4%

Chalmers JD, Goeminne P, Alberti S, McDonnell MJ, Lonn S, Davidson J, Poppelwell L, Salth W, Pesci A, Dupont LJ, Fardon TC, De Soyza A, Hill AT. The bronchiectasis severity index: An international derivation and validation study. *Am J Respir Crit Care Med*. 2014 Mar 1;189(5):576-85. doi: 10.1164/rccm.201309-1575OC. PMID: 24328736; PMCID: PMC3977711.

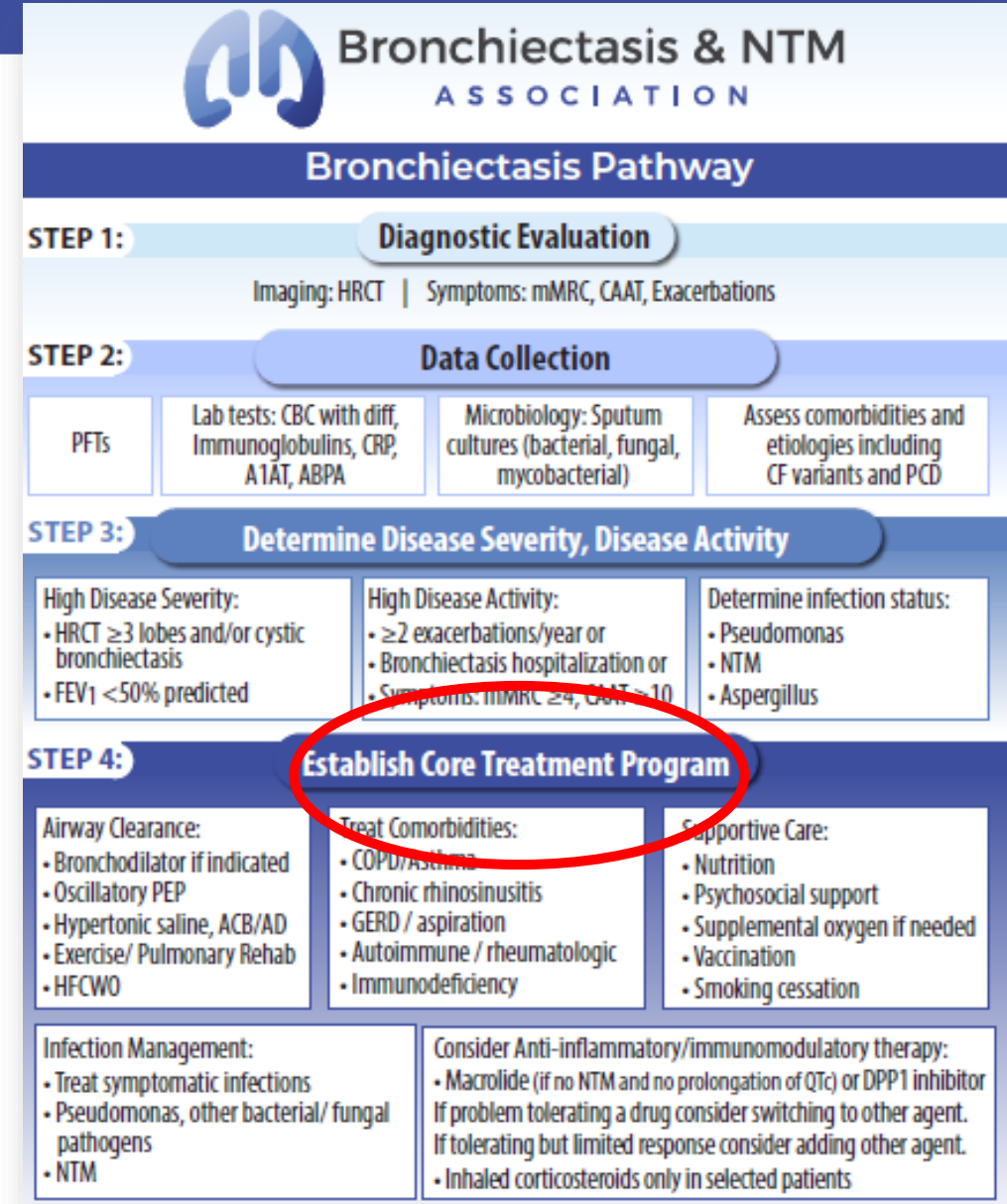


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Establishing a Core Treatment Program

- Airway Clearance
- Treat Comorbidities
- Supportive Care
- Infection Management
- Consider Anti-Inflammatory Therapy

Not one size fits all

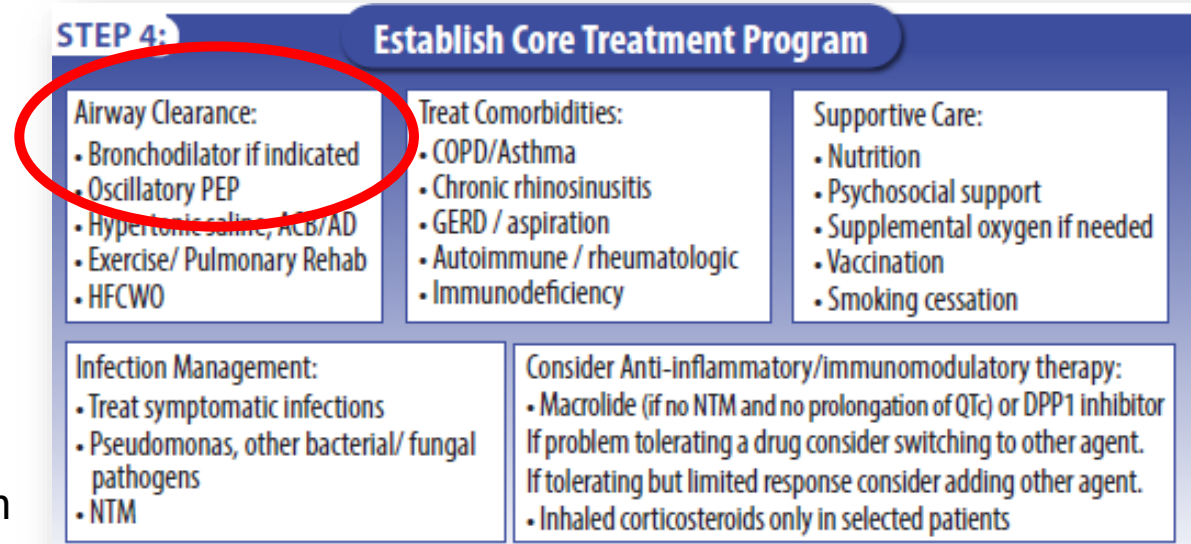


Treatment Program - Airway Clearance

- **Airway Clearance**

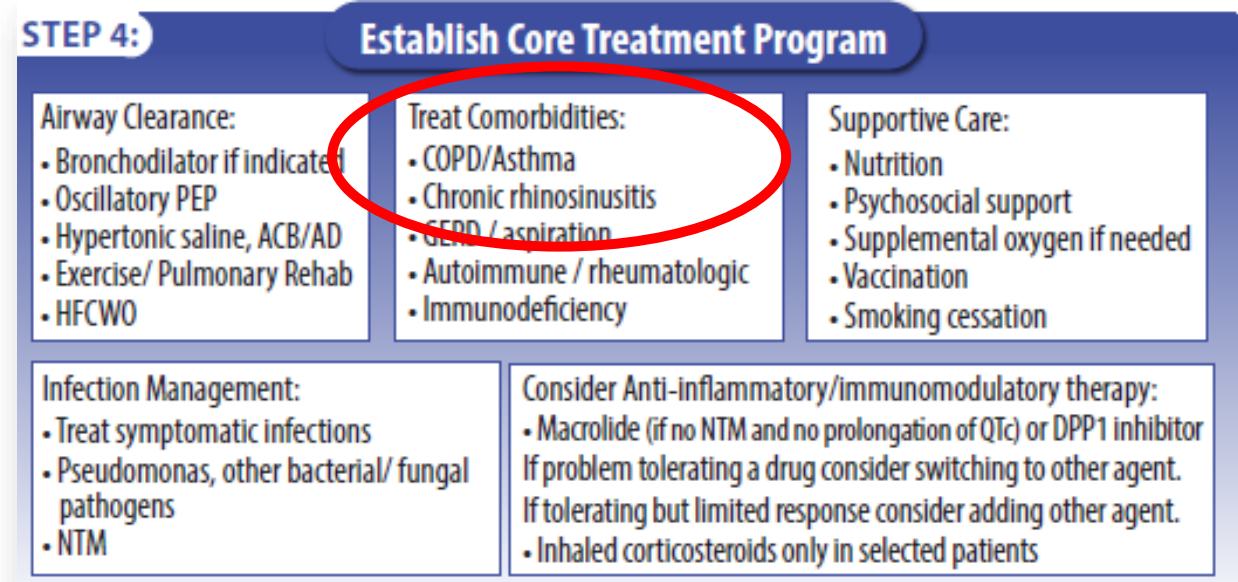
- Bronchodilator if indicated
- Hypertonic saline nebulized
- Manual airway clearance techniques
 - Active Cycle of Breathing, autogenic drainage, huff cough, postural drainage & positioning
- Devices
 - Oscillatory Positive Expiratory Pressure (OPEP), high Frequency Chest Wall Oscillation (HFCWO), Intrapulmonary percussive ventilation (IPV), Positive expiratory pressure (PEP)
- Exercise/pulmonary rehab

- Treat Comorbidities
- Supportive care
- Infection Management
- Consider Anti-inflammatory therapy



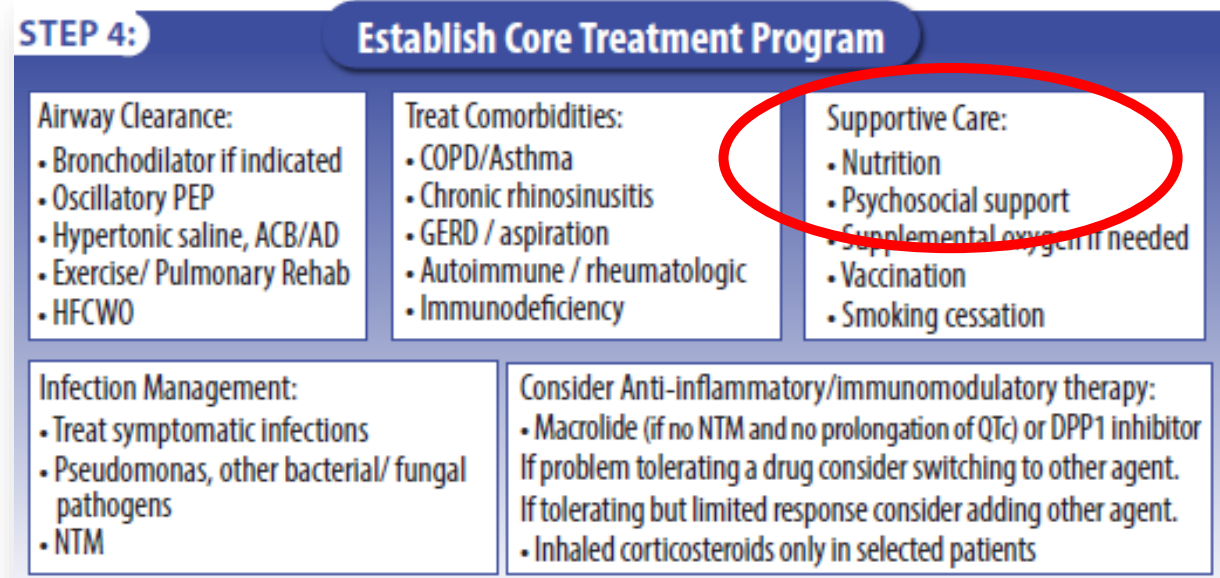
Treatment Program - Treat Comorbidities

- Airway Clearance
- **Treat Comorbidities**
 - COPD/Asthma
 - Chronic rhinosinusitis
 - GERD / aspiration
 - Autoimmune / rheumatologic
 - Immunodeficiency
- Supportive care
- Infection Management
- Consider Anti-inflammatory therapy



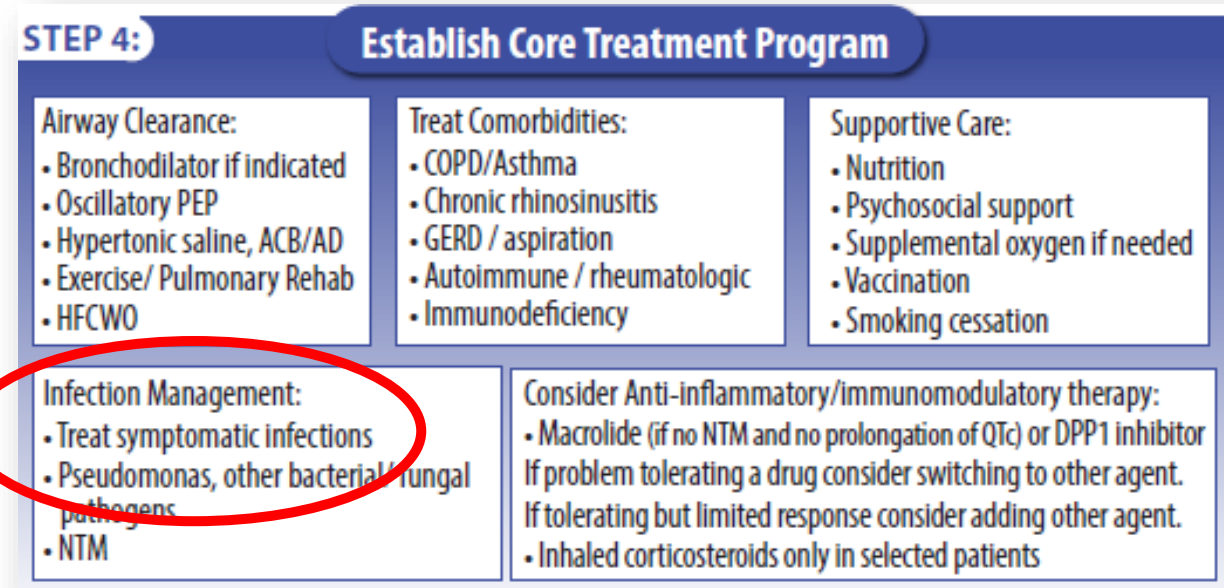
Treatment Program - Supportive Care

- Airway Clearance
- Treat Comorbidities
- **Supportive Care**
 - Nutrition
 - Psychosocial support
 - Supplemental oxygen if needed
 - Vaccination
 - Smoking cessation
- Infection Management
- Consider Anti-inflammatory therapy



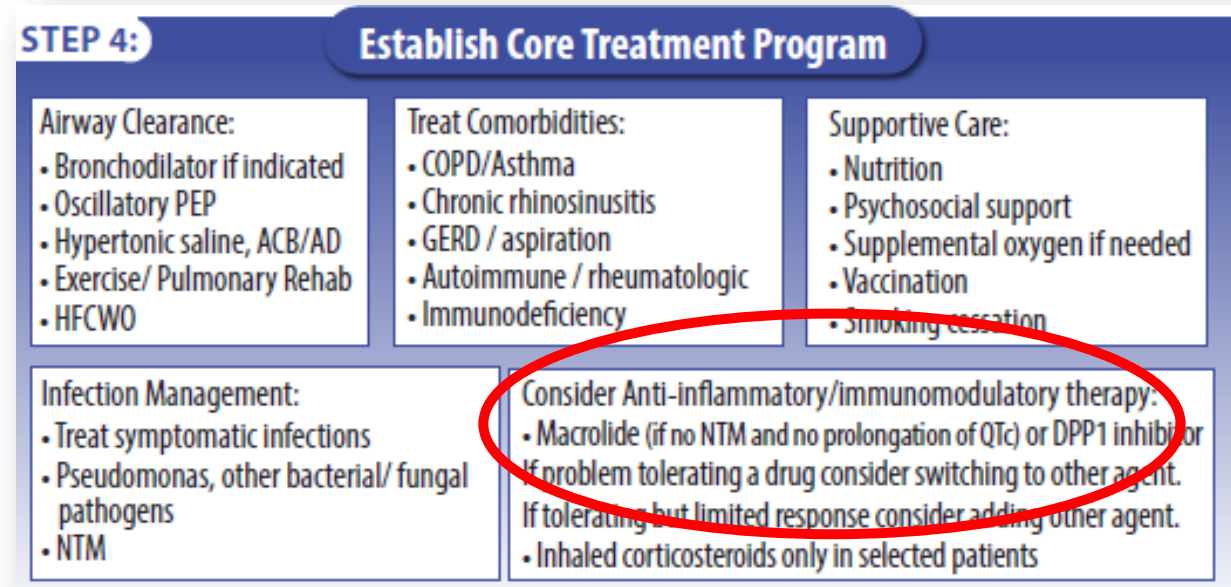
Treatment Program - Infection Management

- Airway Clearance
- Treat Comorbidities
- Supportive Care
- **Infection Management**
 - Treat symptomatic infections
 - Pseudomonas, other bacterial/fungal pathogens
 - Non-tuberculous mycobacterium (NTM)
- Consider Anti-inflammatory therapy

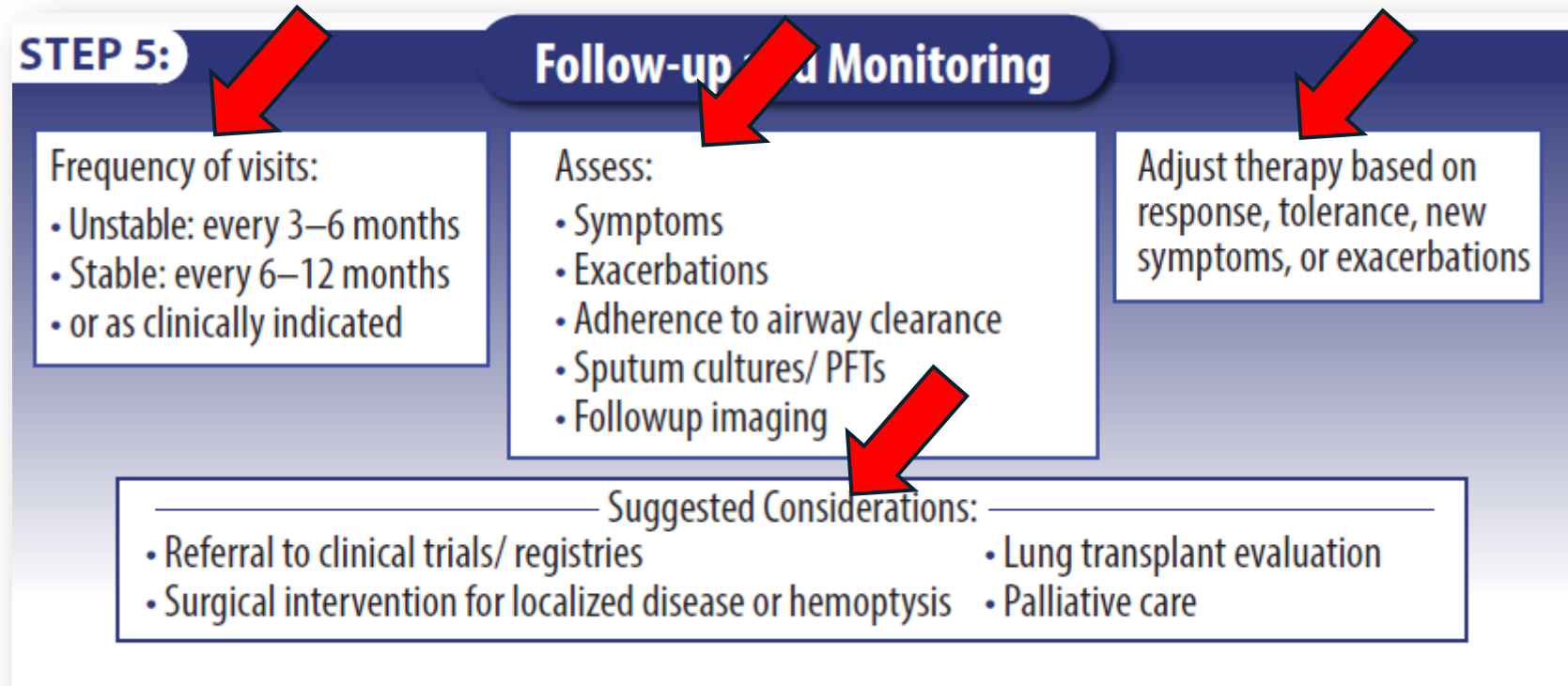


Treatment Program - Anti-inflammatory Therapy

- Airway Clearance
- Treat Comorbidities
- Supportive Care
- Infection Management
- **Consider Anti-inflammatory therapy**
 - Immunomodulator therapy
 - Macrolide (if no NTM) or DPP1 inhibitor
 - Switch / add if persist symptoms
 - Inhaled corticosteroids only in selected patients



Follow-up and Monitoring



Longitudinal follow-up essential



Bronchiectasis & NTM
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Nontuberculosis Mycobacterial - Pulmonary Disease

NTM-PD

Most patient with NTM-PD have bronchiectasis

- **Diagnosis:**

- Clinical: Compatible symptoms and exclusion of other diagnosis
- Microbiologic: At least 2 positive sputum cultures with the same species/subspecies
- Radiologic: Compatible radiologic abnormalities

- **Microbiology:**

- *M avium* Complex (MAC)- several species
 - Most common are *M avium* and *M intracellulare*
- *M abscessus*- 3 subspecies
 - *M abscessus*, *M bolletii*, *M massiliense*

Nontuberculous Mycobacteria (NTM)	
Diagnosis (Specific to NTM PD: Diagnosis is based on all 3 criteria) Clinical: compatible symptoms and exclusion of other diagnoses Microbiologic: At least 2 positive sputum cultures with the same species/subspecies Radiologic: compatible radiologic abnormalities	
Microbiology • Culture with solid and liquid media recommended • Species identification with molecular identification preferred MAC and <i>M. abscessus</i> most common <i>M avium</i> complex (MAC) – 10 species, most common are <i>M avium</i> and <i>M intracellulare</i> <i>M abscessus</i> – 3 subspecies: <i>M abscessus</i> , <i>M bolletii</i> , <i>M massiliense</i>	
Drug susceptibility testing MAC – test for macrolide and amikacin susceptibility <i>M abscessus</i> – test for CLSI recommended antibiotics and inducible macrolide resistance	
Treatment • Initiation of treatment or “watchful waiting” dependent on benefit-risk assessment • Goals of care: Culture conversion versus improving symptoms versus slowing progression • Shared decision making is essential: acceptance, burden of treatment, goals of care • Early treatment may favor less intense medications and better tolerance • Risk factors for progression: fibrocavitary (FC) versus nodular bronchiectatic (NB), age, low BMI (<18.5), increased inflammatory markers (CRP, ESR), low albumin, male sex • Severity factors: FC versus NB disease, multi-lobar, AFB smear positivity, presence of co-morbidities	
Treatment of MAC (dosing available on app) • Azithromycin, ethambutol, rifampin • Nodular bronchiectatic: T.L.W. dosing versus fibrocavitary: Q.D. dosing plus T.L.W. IV amikacin	
Refractory or Recurrent MAC NTMPD • Refractory defined as remaining sputum culture positive after at least 6 months of guideline-based therapy • Treatment: Assess adherence to the treatment regimen, obtain repeat drug susceptibility test results, consider determination of serum drug concentrations, add amikacin liposome inhalation (ALIS) suspension to regimen, consider addition of another drug, and consider surgical resection • Referral: Consider referral to specialized center of NTMPD care	
Macrolide Resistant MAC NTMPD Referral to a specialized center of NTMPD care	
Treatment of <i>M abscessus</i> (dosing available on app) IV medications: amikacin, imipenem or ceftazidime, tigecycline Macrolide resistant: Initial Phase: 2–3 IV drugs, 2–3 oral drugs Continuation Phase: 2–3 oral drugs Oral: azithromycin, bedaquiline, clofazimine, linezolid or tedizolid, omadacycline Macrolide susceptible: Initial Phase: 1–2 IV drugs, 2 oral drugs Continuation Phase: 2–3 oral drugs	
Monitoring on Treatment • Treatment response: Sputum cultures every 1–2 months, low dose chest CT or other imaging at 3–6 months and then every 6–12 months and end of treatment, CRP/ESR if elevated at baseline • Adverse drug reactions: CBC, CMP at baseline and every 1–3 months, visual acuity and red/green color discrimination at baseline and every 2–3 months, audiogram at baseline and every 2–3 months in people receiving an aminoglycoside, EKG at baseline and every 3–6 months in people receiving a macrolide, clofazimine, or bedaquiline • Monitoring to be done sooner in event of new symptoms or concerns	
Duration of Treatment Dependent on goals of care, generally 12 months after sputum culture conversion	
Referral Consider referral to a specialized center for: refractory MAC, recurrent MAC, macrolide resistant MAC, <i>M abscessus</i> (especially if macrolide resistant), consideration of surgical intervention, development of medication intolerance, uncertain goals of care, refractory co-morbidities.	

Nontuberculosis Mycobacterial Pulmonary Disease

NTM-PD

• Treatment:

- “Watchful Waiting”
- Antibiotics
 - Often 3 to 4 antibiotics used simultaneously
 - Treatment may last 18-24 months
- Airway Clearance
- Nutrition
- Pulmonary Rehabilitation and Exercise
- Surgery (for localized disease not responding well to antibiotics)
- Even after successful treatment, there may be up to a 30–50% risk of reinfection

Nontuberculous Mycobacteria (NTM)	
Diagnosis (Specific to NTM PD: Diagnosis is based on all 3 criteria) Clinical: compatible symptoms and exclusion of other diagnoses Microbiologic: At least 2 positive sputum cultures with the same species/subspecies Radiologic: compatible radiologic abnormalities	
Microbiology Culture with solid and liquid media recommended Species identification with molecular identification preferred MAC and <i>M. abscessus</i> most common <i>M. avium</i> complex (MAC)—10 species, most common are <i>M. avium</i> and <i>M. intracellulare</i> <i>M. abscessus</i> —3 subspecies: <i>M. abscessus</i> , <i>M. bolletii</i> , <i>M. massiliense</i>	
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Treatment of <i>M. abscessus</i> (dosing available on app) IV medications: amikacin, imipenem or ceftazidime, tigecycline Oral: azithromycin, bedaquiline, clofazimine, linezolid or tedizolid, omadacycline Macrolide resistant: Initial Phase: 2–3 IV drugs, 2–3 oral drugs Continuation Phase: 2–3 oral drugs Macrolide susceptible: Initial Phase: 1–2 IV drugs, 2 oral drugs Continuation Phase: 2–3 oral drugs	
Monitoring on Treatment Treatment response: Sputum cultures every 1–2 months, low dose chest CT or other imaging at 3–6 months and then every 6–12 months and end of treatment, CRP/ESR if elevated at baseline Adverse drug reactions: CBC, CMP at baseline and every 1–3 months, visual acuity and red/green color discrimination at baseline and every 2–3 months, audiogram at baseline and every 2–3 months in people receiving an aminoglycoside, EKG at baseline and every 3–6 months in people receiving a macrolide, clofazimine, or bedaquiline Monitoring to be done sooner in event of new symptoms or concerns	
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Referral Consider referral to a specialized center for: refractory MAC, recurrent MAC, macrolide resistant MAC, <i>M. abscessus</i> (especially if macrolide resistant), consideration of surgical intervention, development of medication intolerance, uncertain goals of care, refractory co-morbidities.	

Respiratory Therapists Play an Ongoing Role

- Patient Education and Self-Management
 - Explain disease, exacerbation warning signs, and when to seek care
 - Reinforce adherence to airway clearance and medications
- Teaching Airway Clearance
 - Instruct techniques (huff cough, active cycle of breathing, autogenic drainage)
 - Coach use on devices (PEP, OPEP, vest, nebulizers)
 - Help individualize airway clearance plans and adjust as disease changes
- Supporting Inhaled therapies
 - Optimize inhaler and nebulizer technique



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Respiratory Therapists Play an Ongoing Role

- Assessing breathing and lung function
 - Perform spirometry
 - 6-minute walk test
- Pulmonary Rehabilitation and Exercise
 - Lead programs to improve endurance, strength, and dyspnea control as well as lung health strategies
- Care Coordination (pulmonary navigation)
 - Help plan transitions after hospitalization and exacerbations



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Objective - Bronchiectasis

- Understand the pathophysiology and epidemiology
- Bronchiectasis Pathway
 - When to Suspect Bronchiectasis – signs and symptoms
 - Diagnostic Workup, Data Collection, Disease Severity, Core Treatment, and Follow-up/Monitoring
 - Non-tuberculosis Mycobacterial Pulmonary Disease (NTM)
 - Respiratory Therapists' Role in Bronchiectasis Care
- 2025 Bronchiectasis Guidelines
- Increasing Awareness and World Bronchiectasis Day
- Summary and Q&A

2025 Bronchiectasis Guidelines



Objective - Bronchiectasis

- Understand the pathophysiology and epidemiology
- Bronchiectasis Pathway
 - When to Suspect Bronchiectasis – signs and symptoms
 - Diagnostic Workup, Data Collection, Disease Severity, Core Treatment, and Follow-up/Monitoring
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Bronchiectasis and NTM Care Center Network

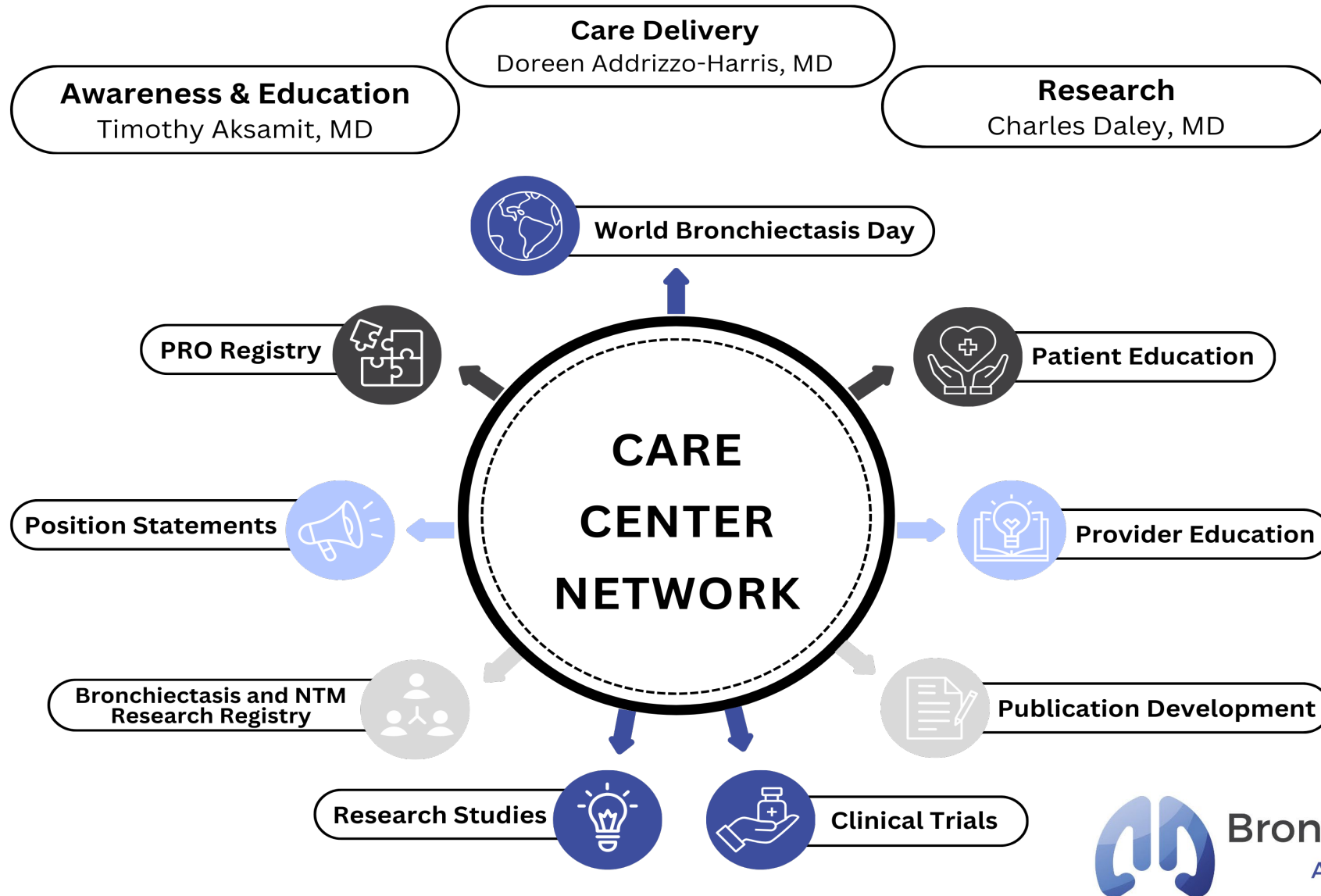


The Bronchiectasis and NTM Care Center Network mission is to **establish a network of centers across the country, with the goal of reducing the time to diagnosis and supporting high-quality bronchiectasis and nontuberculous mycobacterial (NTM) lung disease care.**

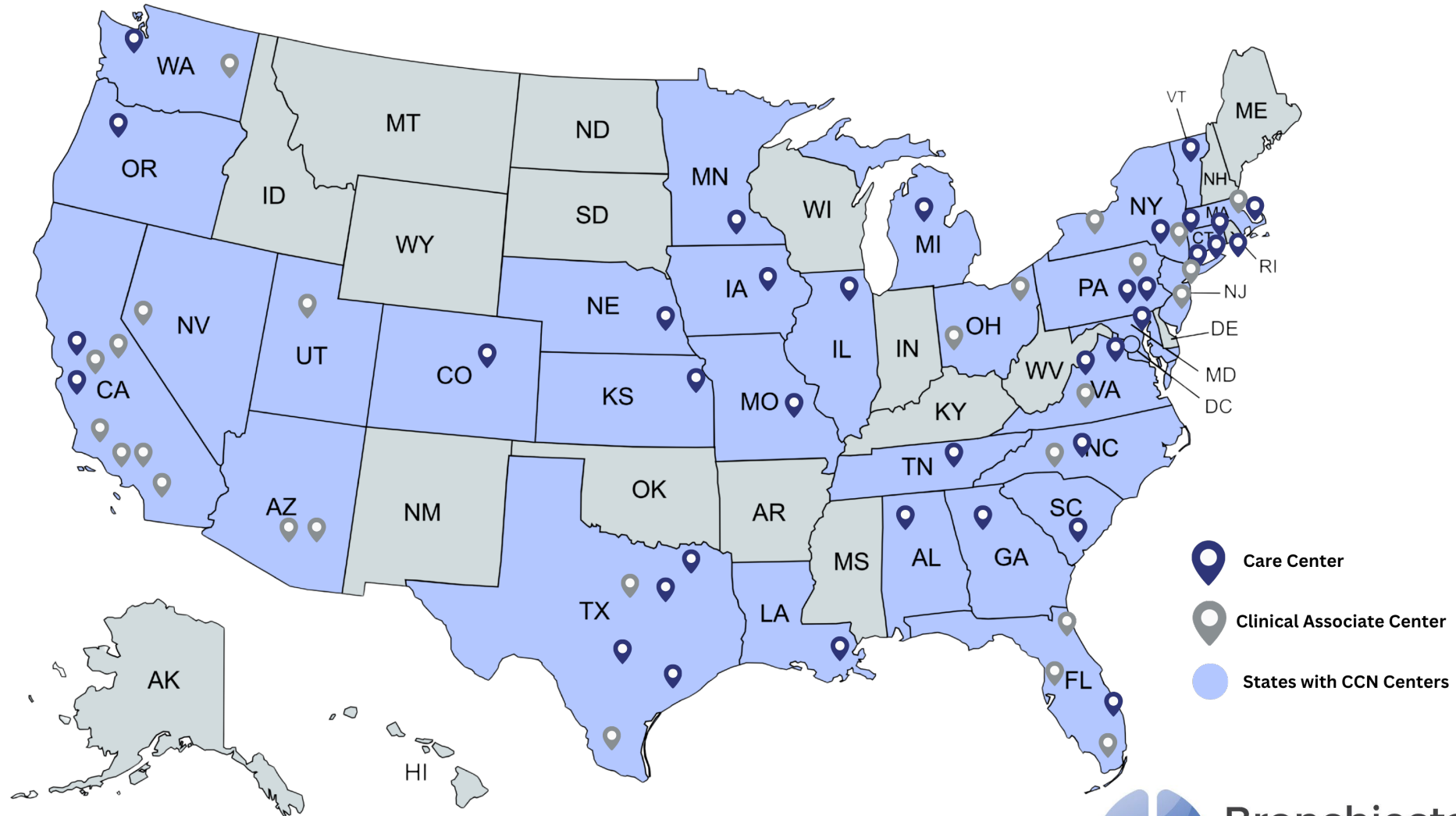


The Vision of the Bronchiectasis and NTM Care Center Network is that **every patient receives a prompt, accurate diagnosis; the highest quality, patient-centered care; and the resources, education and support necessary to properly manage their disease.**

Bronchiectasis and NTM Care Center Network



Bronchiectasis and NTM Care Center

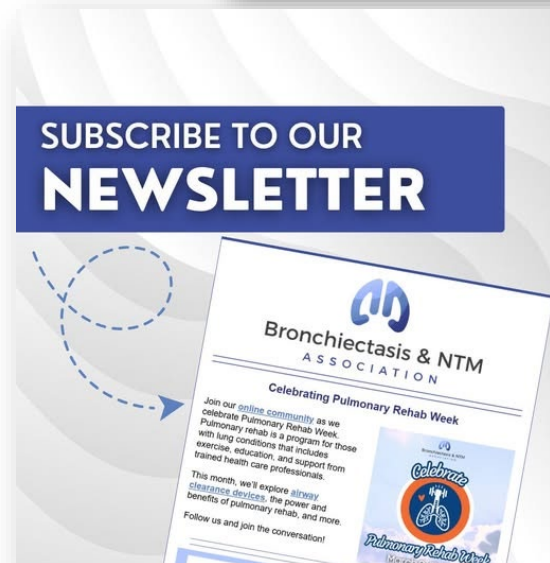


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Patient Education and Support

BronchandNTM.org

- Downloads Library
- Podcast Channel
- Newsletter
- BronchandNTM360Social
- Find a CCN location



WALLET CARD

Wallet cards can be helpful for organizing your medication information and sharing it with others. Fill out this wallet card, cut it out, and carry it with you. For personal use only. Permission required for all other uses.

Medication Record For:	Vaccines	Medications	Medication Allergies	Sputum Culture
Date(s): Pneumococcal _____ Flu _____ COVID-19 _____ Pertussis _____ Shingles _____				
Name _____				
Date _____				
 Bronchiectasis & NTM ASSOCIATION				
Emergency Contact Name: _____ Phone#: _____			*Macrolide monotherapy (azithromycin/clarithromycin) is not recommended for those at risk of NTM.	



Bronchiectasis & NTM
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WBD Global Partner Resources



World Bronchiectasis Day July 1, 2026



World Bronchiectasis Day aims to raise global awareness, share knowledge, and discuss ways to reduce the burden of bronchiectasis for patients and their families worldwide.

Join us in spreading the word!

www.WorldBronchiectasisDay.org



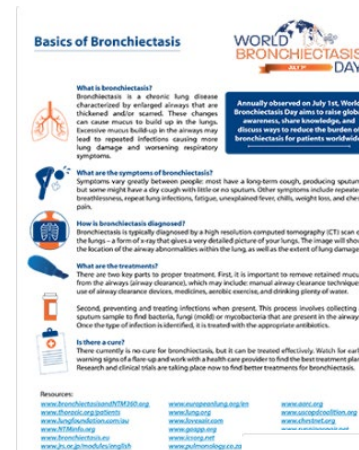
WBD Global Partner Resources



WorldBronchiectasisDay.org

Resources available in:

- English
- Japanese
- Arabic
- German
- Spanish
- Portuguese
- Italian
- French
- Traditional Chinese
- Simple Chinese



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Questions



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