

Service Company Memorial Education

#### **Bronchiectasis and Airway Clearance Underdiagnosed and Undertreated**

#### Joseph Khabbaza, MD

Cleveland Clinic **Respiratory Institute** 

Pulmonary and Critical Care Physician **Cleveland Clinic Respiratory Institute** Cleveland, OH





- I receive speaking/consulting fees from Insmed
- I give unbranded disease state talks on Mycobacterium Avium Complex pulmonary disease

#### Objectives



- Understand the definition and pathophysiology of bronchiectasis
- How to diagnose bronchiectasis
- Basic management of bronchiectasis
- Review the vital role of airway clearance in the management of bronchiectasis
- When does vest therapy come into play

#### Bronchiectasis



- Greek: bronkhia (airway) and ektasis (widening)
- Features similar to COPD/asthma
  - Inflamed and easily collapsible airways
  - Obstruction of airflow
  - Frequent exacerbations
- Irreversible dilation and destruction of bronchial walls

#### Bronchiectasis





#### Bronchiectasis



- Nonspecific symptoms
- Often misdiagnosed and treated as asthma or COPD
- Often not considered in the differential diagnosis of chronic cough
- Significant utilization of health care system:
  - Hospitalizations
  - Clinic visits
  - Imaging and laboratory tests
  - antibiotics

### Epidemiology



- First described by Rene Laennec in 1819
- Prevalence varies from country to country
- Estimated 350,000 500,000 in the US
- More Common in women and older age





## Epidemiology



- Considered untreatable prior to the development of antibiotics in the 1950s
- Common in Western world around WWI
  - 40% mortality before age 40
- Successful pertussis and measles vaccination reduced mortality in developed countries
  - "orphan disease" and research shifted away

# Types of Bronchiectasis Medical Service Company





https://bronchiectasis.com.au/bronchiectasis/bronchiectasis/definition

#### Symptoms



- Cough
  - Dry or productive
- Shortness of breath
- Recurrent pneumonia
- Frequent asthma or COPD exacerbations
- Hemoptysis
- GERD or recurrent sinus infections?

#### Causes



- Primary immunodeficiency (CVID)
- Post-infection (TB, measles, pertussis)
- Non-tuberculous mycobacteria
- Impaired muco-ciliary clearance (CF, PCD)
- Toxic inhalation (GERD, chronic aspiration)
- Airway obstruction (tumor, foreign body)
- Obstructive airway disease (COPD, asthma, A1AT)





- Inflammatory bowel disease
- Autoimmune disease (RA, Sjogren's, sarcoidosis)
- Interstitial lung disease (traction bronchiectasis)
- Secondary immunodeficiency (HIV, hematologic malignancy)

#### NTM





https://radiopaedia.org/cases/pulmonary-mycobacterium-avium-complex-infection-1

#### ABPA





![](_page_13_Picture_3.jpeg)

https://www.ijri.org/viewimage.asp?img=IndianJRadiolImaging\_2011\_21\_4\_242\_90680\_f22.jpg

## Infectious and Inflammatory Cycle

- Inflammatory insult
  - Disordered muco-ciliary clearance
    - Airflow obstruction
      - Chronic or recurrent infections
        - » Bronchial wall damage
- Inflammatory insult

![](_page_14_Picture_7.jpeg)

![](_page_14_Picture_8.jpeg)

![](_page_15_Picture_0.jpeg)

#### **Bronchiectasis Cycle**

![](_page_15_Figure_2.jpeg)

https://onlinelibrary.wiley.com/doi/full/10.1111/ijcp.12924

#### Bronchiectasis and COPD

![](_page_16_Picture_1.jpeg)

![](_page_16_Figure_2.jpeg)

### Work-up

![](_page_17_Picture_1.jpeg)

- Once diagnosis made by HRCT:
  - Spirometry
  - Sputum cultures including AFB and Fungal
  - Immunoglobulins (IgG, IgE, IgA, IgM)
  - A1AT
  - PCD suspicion: Nasal nitric oxide (eNO) and cilial biopsy with electron microscopy
  - Autoimmune serologies (ANA, ANCA, ENA, RF, anti-CCP)
  - HIV

#### HRCT

![](_page_18_Picture_1.jpeg)

![](_page_18_Picture_2.jpeg)

*Figure 3*. Radiographic signs of bronchiectasis. A = Bronchus terminating in a cyst; B = lack of bronchial tapering as it travels to the periphery of the lung; C = signet ring sign (bronchus is larger than the accompanying vessel); D = mucus plug (mucus completely filling the airway lumen).

#### Treatment

![](_page_19_Picture_1.jpeg)

- Different for each diagnosis
  - » Immunoglobulin replacement
  - » Antibiotics for NTM
  - » Steroids and anti-fungal for ABPA
  - » Immunosuppression for autoimmune disease
  - » Recurrent aspiration medical and surgical management
  - » CPAP for tracheobronchomegaly
  - » Inhaled steroids for asthma phenotype

### **Reflux Pillow**

![](_page_20_Picture_1.jpeg)

![](_page_20_Figure_2.jpeg)

#### Treatment

![](_page_21_Picture_1.jpeg)

- Optimizing treatment of the underlying cause
- Antibiotics targeting culture results for acute exacerbations/infections
- Chronic macrolide and/or inhaled antibiotics for prophylaxis
  - Daily azithromycin if 2 > exacerbations per year
- Airway clearance crucial
  - » Therapeutic and prophylactic

#### **Break the Cycle**

![](_page_22_Picture_1.jpeg)

![](_page_22_Picture_2.jpeg)

![](_page_22_Figure_3.jpeg)

https://bronchiectasis.com.au/bronchiectasis/bronchiectasis/definition

#### Follow-up/Prevention

![](_page_23_Picture_1.jpeg)

- 2-4 visits per year
- Spirometry 2x per year
- Sputum culture at least 2x per year
- Vaccinations
- Review of airway clearance and exercises
  - Pulmonary rehab

## **Clear Airways**

![](_page_24_Picture_1.jpeg)

- Less mucus
- Improved ventilation
- Reduced obstruction
- Less bacterial load
- Less infection
- Less exacerbations

![](_page_24_Figure_8.jpeg)

#### **Respiratory Therapists**

![](_page_25_Picture_1.jpeg)

- The most important caregivers in the successful management and treatment of bronchiectasis patients
- Airway clearance education, follow-up on techniques, adding new maneuvers, pulmonary rehab coach, induced sputum, etc.

#### **Airway Clearance**

![](_page_26_Picture_1.jpeg)

- Most important treatment to break the cycle
- Time intensive
- Compliance can be poor
  - Can take weeks before starting to see results
- Not enough patient education
  - Poor understanding of why it is needed

### **Airway Clearance**

![](_page_27_Picture_1.jpeg)

- Exercise
  - 150 min moderate intensity exercise per week (treadmill, stationary bike, yoga, core strength)
  - Pulmonary rehab
- Bronchodilators
- Hypertonic saline
- Positive expiratory pressure devices (acapella)
- Vest
- Breathing maneuvers / postural drainage and percussion

### **Airway Clearance**

#### "The Triple"

- 1. Nebulized albuterol BID
- 2. Hypertonic saline BID
- 3. Acapella BID or more (10-20 breaths followed by 2-3 huff coughs)

![](_page_28_Picture_5.jpeg)

![](_page_28_Picture_6.jpeg)

![](_page_28_Picture_7.jpeg)

![](_page_28_Picture_8.jpeg)

![](_page_28_Picture_9.jpeg)

## Huff Cough

![](_page_29_Picture_1.jpeg)

- Forced expiration technique, alternative to deep coughing
  - Deeper breaths and using diaphragm + abdominal muscles to make a series of rapid exhalations to help move mucus to larger airways

![](_page_29_Picture_4.jpeg)

Inhale deeply through the nose, relaxing abdominal muscles

Lean forward & exhale sharply with 2-3 thuff sounds, contracting abdominal muscles

#### **Postural Drainage**

![](_page_30_Picture_1.jpeg)

![](_page_30_Picture_2.jpeg)

![](_page_30_Picture_3.jpeg)

#### IMPACT

![](_page_31_Picture_1.jpeg)

- Individual management of patient airway clearance therapy
  - Toolset developed to help assess, evaluate, and educate patients on airway clearance options
  - Structured discussion in the office
  - Improved compliance by understanding barriers
  - Stresses long term benefit

![](_page_32_Picture_0.jpeg)

![](_page_32_Picture_1.jpeg)

![](_page_32_Picture_2.jpeg)

![](_page_32_Picture_3.jpeg)

![](_page_32_Picture_4.jpeg)

#### IMPACT

![](_page_33_Picture_1.jpeg)

(

Patient:

Date:

Physician:

#### **20th** Memorial Education Forum

![](_page_33_Picture_3.jpeg)

#### AIRWAY CLEARANCE ASSESSMENT

#### There are no right or wrong answers to this survey.

Please answer as truthfully as possible so we can work together to find the best airway clearance treatment(s) for you and your lifestyle.

Which airway clearance methods are you currently using? Please circle the device(s) you are using.						Ho	w many times each week?	How long each time?	
Exercise (please specify	which	type):							
Huff Coughing									
Positive Expiratory Press	sure (PE	P) (e.g., PEP Valve, PEP Mask)							
Oscillating Positive Expl	ratory F	Pressure (OPEP) (e.g., Acapella <sup>e</sup> , A	erobika	*, Lung Flute*)					
Chest Physical Therapy	(CPT)/	Postural Drainage							
High-Frequency Chest V	Vall Oso	cilation (AffloVest® The Vest®, InC	ourage	SmartVest <sup>a</sup> , Monarch <sup>a</sup> )					
Active Cycle of Breathin	g Techr	niques (ACBT) / Autogenic Draina	ge						
Bronchodilators (e.g., Le	valbute	erol, Albuterol, Salbutamol)							
Hypertonic Saline Conce	entratio	in: %							
None									
Other									
2 To what extent do you agree or disagree with each of the following statements? Check the box that applies to each statement.					Not at All True	A Bit True	Occasionaly True	Somewhat True	Completely True
understand what airwa	y clear	ance is.			0	0	0	0	0
I am not able to explain the benefits of airway clearance.					0	0	0	0	0
I believe airway clearance is an important part of my care routine and makes me healthier.					0		0	0	0
I am not aware of all of the airway clearance options that are available to me.					0	0	0	0	0
I am willing to work closely with my care team to find the airway clearance routine that is best for me.									
My airway clearance skills need improvement.					0	0	0	0	0
consistently do my airs	vay clea	arance routine each day.							
I am unhappy/dissatisfied with my current airway clearance routine.					0	0	0	0	0
I continue doing my airway clearance routine when I am traveling.						0			
I am not comfortable doing airway clearance in front of friends.					0	0	0	0	0
I am able to set aside time each day to perform airway clearance.									
My airway clearance routine gets in the way of doing things I want to accomplish each day.					0	0	0	0	0
I am able to find the time each day to perform alrway clearance.									
Which of the fol or adding a new	lowing airwa	g might get in the way of doi y clearance option? Check al	ng you I îtems	r current airway cleara that apply to your situ	nce routin lation.	• (4)	Use this space not addressed	e to add any I in the secti	thoughts ions above.
High out-of-pocket cost		I don't think it helps me		It may cause bleeding					
It's difficult to set up	0	I don't think I need it	0	It reminds me of my di	sease ()				
It's too complicated		I'm not sure why I should do it		It's embarrassing					
It takes too much time	0	I forget to do it	0	I don't want others to	know ()			103	
It disrupts my daily life		It's uncomfortable/hurts		None of these					
I can't travel with it	0	It makes my cough worse		Other					
Prefer to everylee	0	Gets in the way of social time	0						

The IMPACT Program was created in partnership with the IMPACT Advicey Team and is spensored by International Boylavias Corporation, manufacture of the ABIVests: The IMPACT Advicesy Team is a group of qualified physician and allide physicianolas creaged in alvesy clearance reacesh and development in coordination with and under the auspices of International Biophysics Corporation. This Information is Interned for autometers in the United States only. All other trademarks embedded managements and the reaservise management. SCMD International Biochecks Correction. All index searced and the reaservise of the searce of the trademarks embedded and the second searce of the International Biophysics Corporation.

XXX-XXXXXX DBAFT \_ ANDINO

#### IMPACT

![](_page_34_Picture_1.jpeg)

20th JEAN S. MARX Memorial Education Forum

OUR ACTION PLAN COUR ACTION PLAN copy of this Action Plan should be provided to the patie treference at home. Retain a copy in the patient's chart	he conclusion of the clinic visit	6					
four care team recommends the following airway clea	e routine: How i eac	many times How long ch week? each time?					
Exercise (Please specify which type):							
Huff Coughing							
Positive Expiratory Pressure (PEP) (e.g. PEP Valve, P	lask)						
Oscillating Positive Expiratory Pressure (OPEP) (e.g.	pella®, Aerobika®, Lung Flute®)						
Chest Physical Therapy (CPT) / Postural Drainage							
High Fragmancy Chast Wall Oscillation (ABc)/ast?	(ast In Courses SmartVast Monarchill						
Action Could of Brasthing Techniques (ACOT) (A.	in Drainana						
Active Lycle of Breathing Techniques (ACBT) / Auto	IC UTAINAGE						
Bronchodilators (ALBUTEROL, LEVALBUTEROL, and	кікортомј						
Hypertonic Saline Concentration: %							
Other							
our care team recommends that you view the following	lucational videos at www.IMPACT-BE.com						
onducting Airway Clearance	Peer Support Videos						
Chest Physical Therapy Active Cycle of Brea	Fitting airway clearance into a busy	<u>/ day</u>					
Using the Acapella     V Prypertonic Saline     Z Pacifica Exploration	How alrway clearance improves over	Poing airway clearance inproves ore air year being     Doing airway clearance while on the go*     Doing airway clearance while on vacation					
Z Postural Drainage Z Broochodilators	Doing airway clearance while on va						
/ Vest Therapy (mobile)	Why Airway Clearance is Needed	5000300 -					
Vest Therapy (stationary)	Bronchiectasis: Role of Airway Clea	Bronchiectasis: Role of Airway Clearance Techniques					
Huff Coughing	Overview of Airway Clearance Tech	miques					
our care team recommends that you read the followin	lucational resources at www.IMPACT-BE.com						
bout Bronchlectasis	Conducting Alrway Clearance						
What is Bronchiectasis? (booklet from ATS)	Doing manual chest physiotherapy	2 Doing manual chest physiotherapy (from CF Foundation)					
Treating Bronchiectasis (booklet from ATS)	Ø Using the Acapella (from Smith Med	② Using the Acapella (from Smith Medical)					
Managing Adult Bronchiectasis (booklet from ERS)	Using the AffloVest (from Internation)	🕢 Using the AffloVest (from International Biophysics Corporation)					
* Links to videos and websites are owned and coarated by third sarties	Annu under	I How to Use the InCourage vest (from Respirtech)					
their exclusive control, provided for your information and convenience and are not an endorsement of the linked contant or such third parties	r own risk Performing Huff Cough (from Unive	Performing Huff Cough (from University of Michigan)					
	Active Cycle of Breathing (from CF	Foundation)					
lext Clinic Visit Notes:							
have reviewed this Action Plan with my care team an	gree to follow through with each of the recomme	inded Items listed above.					
	Haalahaana Demilder Cleanture						

![](_page_35_Picture_0.jpeg)

#### **20th** Memorial Education Forum

![](_page_35_Picture_2.jpeg)

#### High Frequency Chest Wall Oscillation (HFCWO)

![](_page_36_Picture_1.jpeg)

20th JEAN S. MARX Memorial Education Forum

![](_page_37_Picture_0.jpeg)

![](_page_37_Picture_1.jpeg)

- Series of oscillating motors creating different pressure waveforms to provide disruption in the lungs and mobilize secretions
- Criteria in confirmed bronchiectasis patients:
  - Daily productive cough for at least 6 months
  - Two or more exacerbations/infections requiring abx per year
  - Failure of other modes of airway clearance
- No single vest is better than the other, each has their own physical features that may appear to certain patients (portability, weight, etc.)

#### Afflovest

![](_page_38_Picture_1.jpeg)

![](_page_38_Picture_2.jpeg)

![](_page_38_Picture_3.jpeg)

#### High Frequency Chest Wall Oscillation (HFCWO)

![](_page_39_Picture_1.jpeg)

![](_page_39_Picture_2.jpeg)

- Three modes of oscillation treatment
  - Percussion
  - Vibration
  - Drainage
- Three levels of intensity
  - 5 Hz
  - 13 Hz
  - 20 Hz

![](_page_40_Picture_0.jpeg)

![](_page_40_Picture_1.jpeg)

- Bronchiectasis is underdiagnosed and thus often incorrectly treated
- When diagnosed, bronchiectasis is often under treated
- In addition to treating the underlying cause, an aggressive airway clearance regimen is crucial to improving patients quality of life in both the short and long run

#### Summary

![](_page_41_Picture_1.jpeg)

- The RT plays a vital role in the successful management of bronchiectasis patients
- Airway clearance regimens are individualized to each patient and understanding the basis behind each method is important for adherence
- Patient education is key for buy-in and optimal compliance

#### **Questions?**

![](_page_42_Picture_1.jpeg)

![](_page_42_Picture_2.jpeg)

#### Thank You

![](_page_43_Picture_1.jpeg)

![](_page_43_Picture_2.jpeg)