



Managing Post-TB Lung Health

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Accreditation Statement

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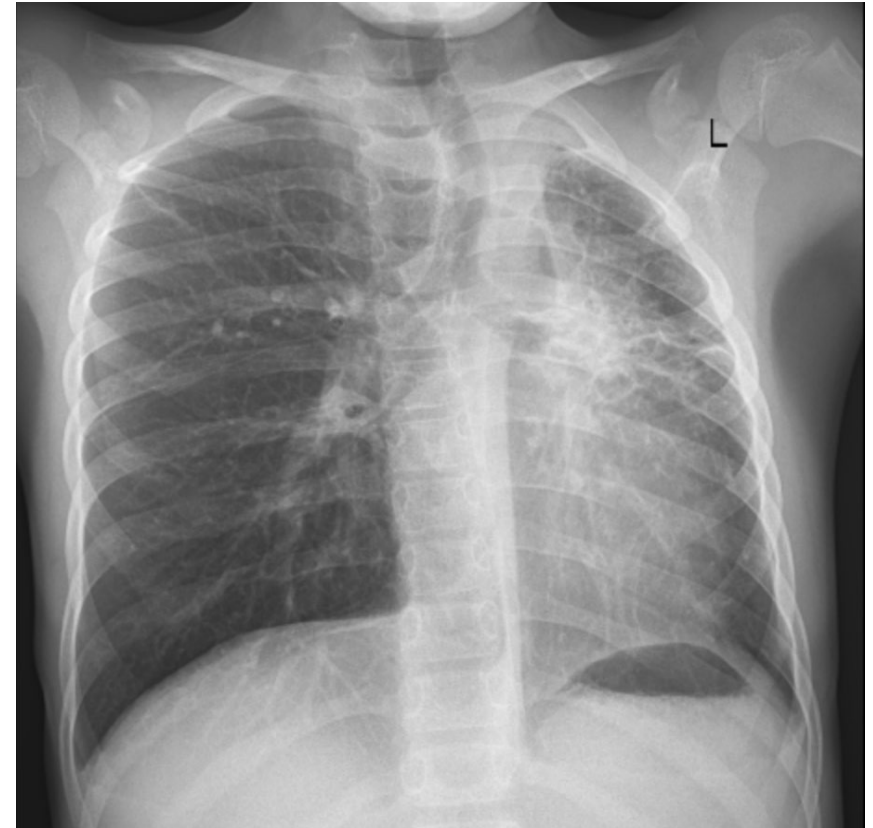
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Learning Objectives

- Describe tools used to assess lung function
- Identify common post-TB lung conditions
- Apply evidence-based strategies to support long-term lung health

Opening case

- 16-year-old female, originally from Uganda
- Completed treatment for pulmonary TB 12 months ago
- Persistent cough
- Unable to keep up with peers during physical activity



Becker, 2025



Since 2000,
83 million lives
have been saved through TB treatment.

But there is more progress to be made.



**10.7
million
people**

were affected by TB
in 2024 alone.

Ending TB is possible.
Fund it, research it, commit to it.

Challenges after TB

- Approximately 9.5 million people survive tuberculosis each year
- Recovery often extends well beyond completion of treatment
- Survivors may experience:
 - Mental health challenges
 - Economic hardship
 - Increased long-term mortality
 - **Persistent lung disease after pulmonary TB**





What is Post-TB Lung Disease (PTLD)?

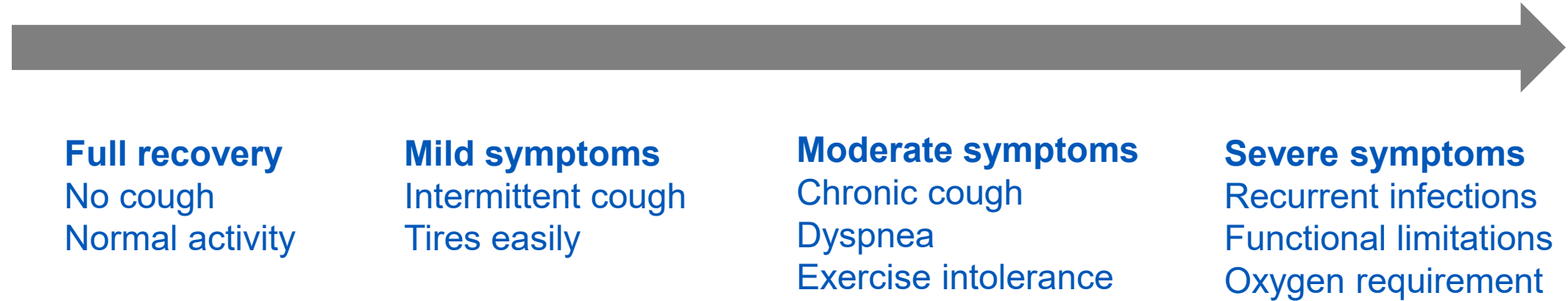
- Chronic respiratory abnormalities that persist after successful treatment of tuberculosis and are attributable, at least in part, to prior TB disease
- Caused by injury to the lungs by *M. tuberculosis* and an excessive host inflammatory response
- Lung disease after TB is often multifactorial, not all abnormalities are caused solely by prior TB
 - Smoking, malnutrition, HIV, air pollution

How common is post-TB lung disease?

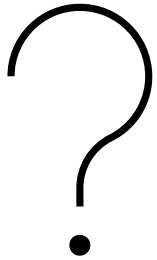
- Estimated that up to one half of TB survivors develop have some form of chronic respiratory disease after TB
- Children and adults are both affected
- Many cases remain undiagnosed



Post-TB lung disease exists on a spectrum



Polling Question



Which patient would you evaluate for post-TB lung disease?

- A. Patient who completed TB treatment 1 month ago and gets short of breath walking up one flight of stairs
- B. Patient who completed treatment 1 year ago and has had two episodes of "pneumonia" in the past 6 months.
- C. Patient who completed treatment 6 months ago and has a chronic productive cough despite negative MTb smear and culture
- D. All of the above

How do I assess for post-TB lung disease?

Clinical History and Quality of Life Assessment

- Detailed history tracking cough frequency, daily sputum production, recurrent respiratory infections, and quality of life
- Validated Tools:
 - St. George's Respiratory Questionnaire (SGRQ) for health-related quality of life
 - Medical Research Council (MRC) Dyspnea Scale to grade functional breathlessness

New constitutional symptoms or worsening respiratory symptoms should prompt evaluation for recurrent or active TB or acute infection before attributing symptoms to PTLD

MRC Dyspnea Scale

Dyspnea only with strenuous exercise	0
Dyspnea when hurrying or walking up a slight hill	+1
Walks slower than people of the same age because of dyspnea or has to stop for breath when walking at own pace	+2
Stops for breath after walking 100 yards (91 m) or after a few minutes	+3
Too dyspneic to leave house or breathless when dressing	+4

St. George's Respiratory Questionnaire

Section 6

These are questions about how your activities might be affected by your breathing.

Please tick (✓) in **each box** that applies to you **because of your breathing**:

	True	False
I take a long time to get washed or dressed	☐	☐
I cannot take a bath or shower, or I take a long time	☐	☐
I walk slower than other people, or I stop for rests	☐	☐
Jobs such as housework take a long time, or I have to stop for rests	☐	☐
If I walk up one flight of stairs, I have to go slowly or stop	☐	☐
If I hurry or walk fast, I have to stop or slow down	☐	☐
My breathing makes it difficult to do things such as walk up hills, carrying things up stairs, light gardening such as weeding, dance, play bowls or play golf	☐	☐
My breathing makes it difficult to do things such as carry heavy loads, dig the garden or shovel snow, jog or walk at 5 miles per hour, play tennis or swim	☐	☐
My breathing makes it difficult to do things such as very heavy manual work, run, cycle, swim fast or play competitive sports	☐	☐

Jones, 1991

Lung Function

- Measures
 - FEV1, Forced Expiratory Volume in 1 second
 - FVC, Forced Vital Capacity
- Relatively inexpensive, can trend over time
- Helps identify obstructive vs more restrictive disease



Kampala Report, 2024



CYSTIC FIBROSIS
FOUNDATION®

PULMONARY FUNCTION TEST



Cystic Fibrosis
Foundation, 2021



Exercise capacity

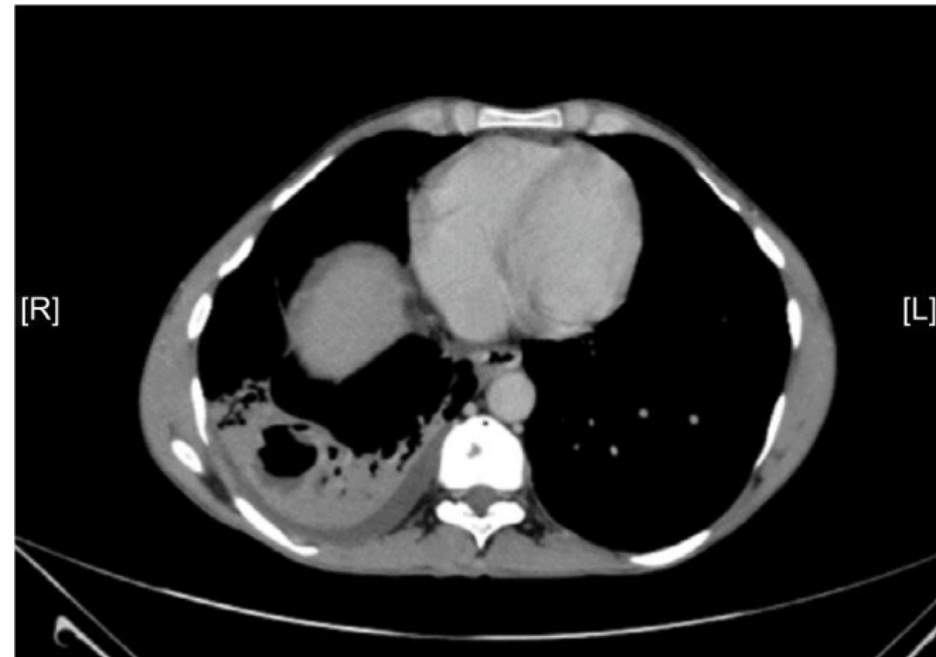
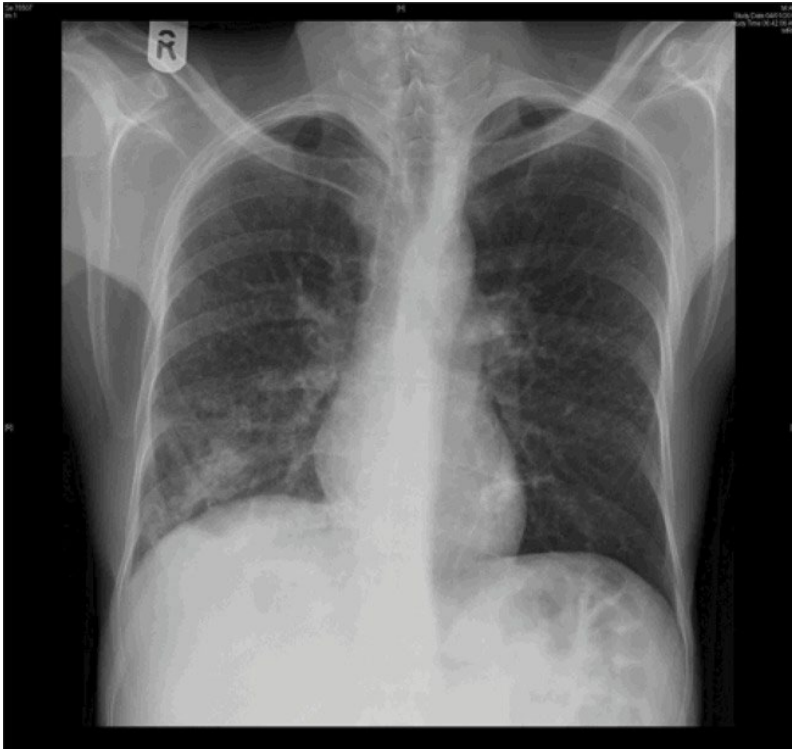
- Six-minute walk test: self-paced clinical test measuring the total distance covered walking on a flat, hard, straight 30-meter course for exactly six minutes
 - Measures integrated functional exercise capacity, cardiopulmonary endurance
 - Poorly correlates with lung function
 - Looks for oxygen requirement with exercise



Chest imaging

- Chest x-ray
 - Establish a new baseline for the patient
 - Widely available globally; serves as the gold standard for initial structural assessment
- Chest CT
 - Obtain if concerning CXR or persistent pulmonary symptoms
 - Provides highly detailed anatomical cross-sections

Comparing chest xray vs chest CT

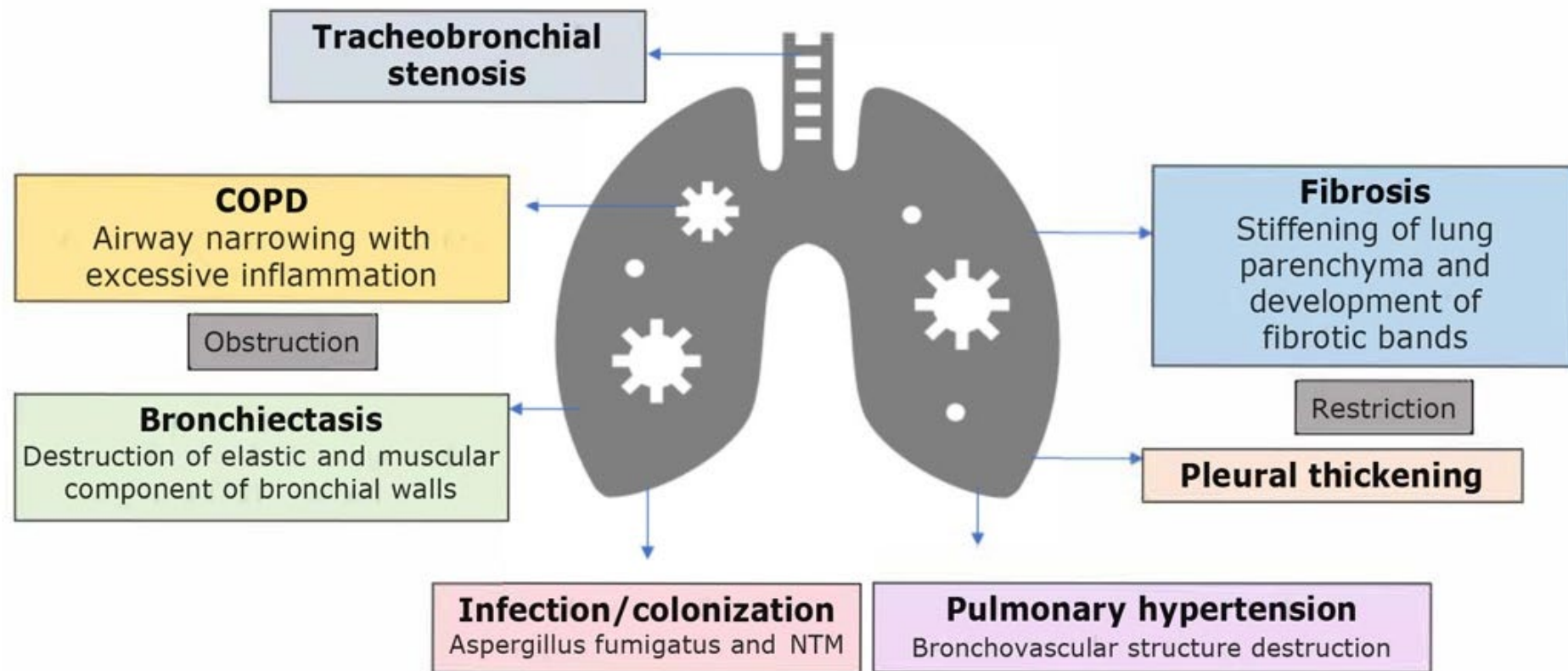




Assessment of post-TB lung disease

- Consensus-based set of Clinical Standards written in 2021
 - Clinical exam and history
 - Quality of life assessment
 - Pulmonary function testing
 - Measuring exercise capacity
 - Chest x-ray +/- CT

Post-TB lung disease includes multiple patterns of lung injury



Bronchiectasis

- Scarring pulls local airways open, creates permanently dilated pouches where secretions pool
- Chronic productive cough, recurrent secondary chest infections, and frequent hemoptysis
- Airway clearance is the cornerstone of treatment

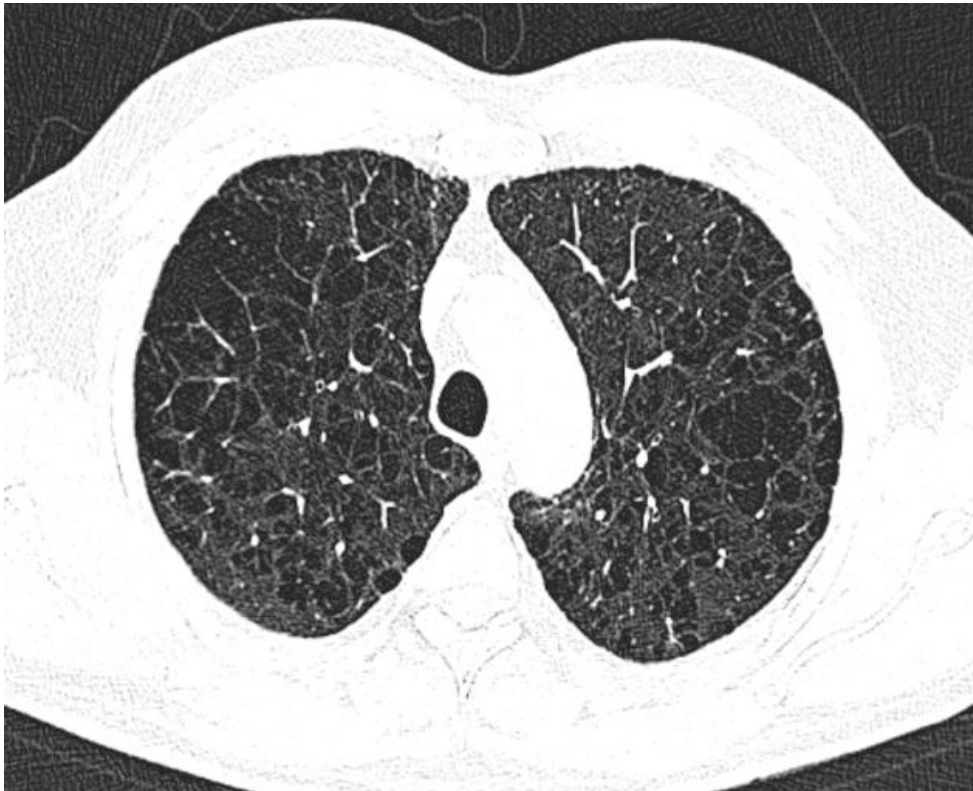


Fibrosis

- Severe host immune inflammation leaves dense, rigid collagen scars across the lung
- Dyspnea on exertion, cough
- Symptoms generally progress over time and limited treatment options



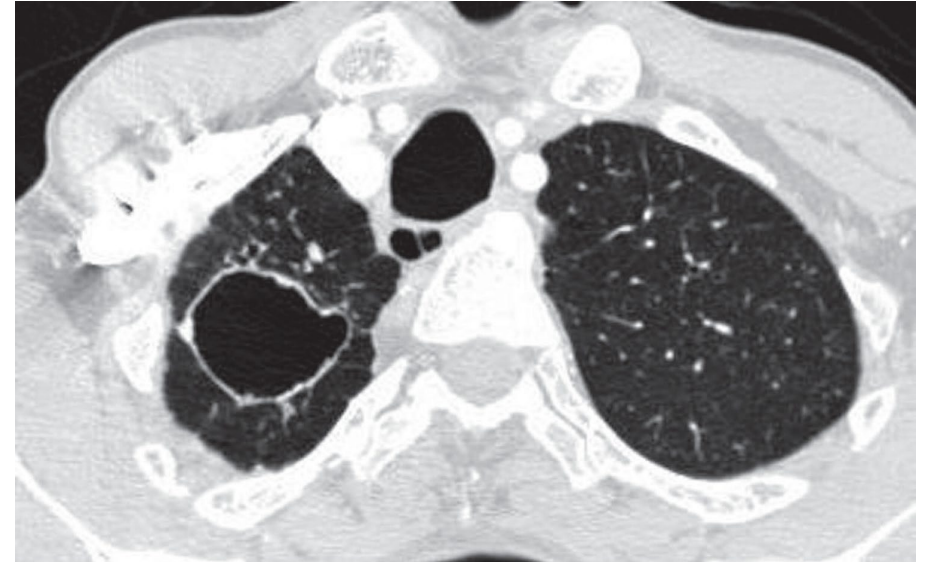
Airflow obstruction and emphysema



- Airflow obstruction = a physiologic abnormality seen on spirometry (reduced FEV_1/FVC)
- Emphysema = a structural abnormality characterized by destruction of alveoli, usually seen on CT imaging
- Wheezing, chronic dyspnea, limited respiratory flow
- Bronchodilator inhalers may be beneficial

Residual cavities

- Cavities remain where tissue was destroyed during the initial infection
- Highly vulnerable to opportunistic colonization by *Aspergillus* or NTM
- Risk for Lung cancer
- Severe cases require surgical resection





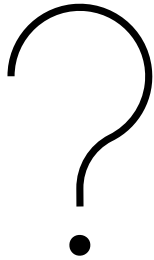
Interventions for post-TB lung disease

- Preventing and treating TB quickly is the most important intervention
- Inhaled bronchodilators if obstructive phenotype
- Smoking cessation
- Vaccination: influenza, COVID, RSV
- Pulmonary rehabilitation
- Medications in the pipeline

Pulmonary rehabilitation

- Goals are to improve functional exercise capacity, reduce dyspnea, improve quality of life
- Shown to increase exercise capacity and QoL
- Core components include:
 - Aerobic exercise
 - Strength training
 - Breathing exercises
 - Education and self-management

Polling Question



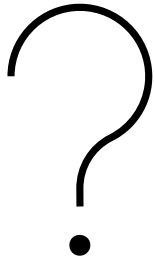
What is the primary goal when we put a patient with permanent Post-TB lung scarring through a pulmonary rehabilitation program?

- A. Reverse scarring and restore original lung tissue
- B. Improve the patient's lung function to normal
- C. Training the skeletal muscles to use oxygen more efficiently to improve quality of life and exercise capacity
- D. To reduce the need for long-term inhalers

Clinical pearls for the TB Provider

- A patient who successfully completed TB treatment is more likely to have an acute respiratory infection rather than recurrent TB
- TB relapse can occur but often in the presence of some other risk factor: HIV, diabetes, treatment interruptions, MDR
- Smear and culture should be used to diagnose recurrent TB, not PCR based assays
- Give patient a copy of end-of-treatment chest xray to have for reference

Polling Question



A patient who was successfully cured of TB 9 months ago walks into a primary care clinic with an acute cough. What is your very first step?

- A. Immediately isolate them and order a GeneXpert/molecular DNA test
- B. Restart their intensive phase TB medications just to be safe
- C. Perform a routine physical exam and history
- D. Refer them to a pulmonologist

Post-TB Lung Disease Research in Uganda

- Collaboration with Makerere University–Johns Hopkins University Research Collaboration (MU-JHU) and the University of Iowa
- Characterized the long-term respiratory consequences of pulmonary TB in Ugandan children
- Evaluated a home-based pulmonary rehabilitation program for children with post-TB lung disease



Research Findings

Characterizing PTLD

- Prior TB was associated with reduced lung function and quality of life compared with sibling controls
- Over 20% of children had persistent lung abnormalities after completing TB treatment

Pulmonary Rehabilitation

- 40/40 completed the six-week home-based program
- 6-minute walk distance improved by ~30 m
- Quality-of-life scores improved with no serious adverse events



Research team at Mulago Hospital

Take home points

- Post-TB lung disease is a common, often overlooked consequence of pulmonary TB
- Evaluation should include respiratory symptoms, lung function, exercise capacity, and chest imaging
- Management focuses on optimizing lung health through symptom-directed therapies, pulmonary rehabilitation, and prevention of further lung injury

Acknowledgements

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Questions and Answers



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Thank you