PAKISTAN CHEST SOCIETY

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STRIVING FOR PULMONARY CARE

Clinical Practice Guidelines

Bronchiectasis

PAKISTAN CHEST SOCIETY-2026

Bronchiectasis Management Guidelines

Pakistan Chest Society

Prepared by the Pakistan Chest Society for National Guidance on the Diagnosis and Management of Bronchiectasis

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March 2026

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Preface

Bronchiectasis, though long recognized as a chronic and debilitating respiratory disorder, continues to pose a substantial public health challenge in Pakistan. Its prevalence in our population is amplified by endemic respiratory infections, notably tuberculosis, and compounded by socioeconomic factors such as limited access to healthcare, environmental exposures, and delayed diagnosis. These distinct epidemiological patterns demand clinical guidance that reflects both international evidence and the realities of our healthcare system.

Recognizing this unmet need, the Pakistan Chest Society (PCS) convened an expert panel to develop the National Guidelines for the Diagnosis and Management of Bronchiectasis. This document is the product of rigorous methodology, adopting the internationally recognized GRADE approach to ensure that recommendations are transparent, balanced, and directly applicable to local practice. Given the limited availability of high-quality research from Pakistan, most recommendations and referenced studies have been adapted from internationally accepted guidelines, notably the European Respiratory Society (ERS) 2025 and British Thoracic Society (BTS) 2019 guidelines. Where local data was available, they were incorporated to contextualize and refine the recommendations.

These guidelines encompass the complete spectrum of bronchiectasis care: from early recognition and diagnosis, through assessment of severity, to the prevention and management of exacerbations, surgical considerations, and long-term follow-up. They also incorporate the concept of "treatable traits," enabling individualized care plans that address the underlying causes and modifiable risk factors most prevalent in Pakistan.

Our vision extends beyond the provision of clinical protocols. We aim to standardize care across all levels of the health system, reduce preventable complications, and enhance the quality of life for individuals living with bronchiectasis. We hope that this guideline will serve as a practical resource for physicians in diverse clinical settings—from tertiary care centers to primary health facilities—while also highlighting the need for further local research, capacity building, and resource allocation for bronchiectasis care in Pakistan.

I express my profound appreciation to all members of the guideline development group, peer reviewers, and supporting staff whose expertise and dedication have been instrumental in producing this document. It is our expectation that, through the widespread adoption of these guidelines, Pakistan will take a significant step forward in improving outcomes for patients with bronchiectasis.

Prof. Muhammad Irfan
Chair, Bronchiectasis Guideline committee
Pakistan Chest Society

Message by the President

Pakistan Chest Society

Bronchiectasis remains a significant yet often under-recognized cause of chronic respiratory morbidity in Pakistan. The Pakistan Chest Society is pleased to present these evidence-based guidelines to standardize diagnosis, improve etiological evaluation, and promote rational long-term management. These recommendations reflect international best practices while being adapted to local resource settings, with the ultimate goal of improving patient outcomes and quality of life.

Prof. Shereen Khan

President
Pakistan Chest Society

Message by the Chairman

Guideline Committee, Pakistan Chest Society

I am pleased to present the Guidelines for the Management of Bronchiectasis by the Pakistan Chest Society, aimed at improving consistency and quality of care for this chronic and often under-recognized respiratory condition in Pakistan. In our setting, bronchiectasis commonly arises from post-infectious causes, particularly tuberculosis, along with environmental exposures—factors that differ from Western populations and necessitate a locally adapted approach.

These guidelines have been developed by the Working Group under the leadership of Prof. Muhammad Irfan, integrating international evidence with regional clinical realities. They emphasize a structured diagnostic approach, including identification of underlying etiologies and appropriate use of investigations such as HRCT and microbiological assessment, to ensure targeted and effective management.

Management is centered on a patient-focused, multidisciplinary strategy, with airway clearance as the cornerstone, supported by bronchodilators, antibiotics guided by culture results, and preventive measures including vaccination, pulmonary rehabilitation, and smoking cessation. Early diagnosis, individualized care, and patient education are key to reducing exacerbations and improving outcomes.

I extend our appreciation to all contributors, particularly Prof. Muhammad Irfan, for their valuable efforts in developing these recommendations. These guidelines reflect our continued commitment to advancing evidence-based respiratory care in Pakistan.

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Chairman Guideline Committee
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Pakistan Chest Society

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Chapter 01:
Summary

1. Definition

Bronchiectasis is a chronic respiratory disease characterized by permanent, abnormal dilation of the bronchi, leading to recurrent infections, chronic inflammation, and progressive lung damage.

2. Etiology and Diagnosis of Bronchiectasis in Pakistan

Etiology

- Idiopathic (unknown etiology in nearly half of the cases)
- Post-infectious causes (e.g., tuberculosis, pneumonia, measles)
- Chronic lung diseases (e.g., COPD, asthma, ABPA)
- Autoimmune diseases (e.g., rheumatoid arthritis, IBD)
- Genetic and immunologic disorders (e.g., PCD, CF, A1AT deficiency)

Diagnosis

Recommended Initial Workup

- History: chronic cough, recurrent infections, purulent sputum, wheeze
- Blood tests: CBC (including eosinophil count), total IgE, Aspergillus-specific IgE, IgA/IgG/IgM
- Sputum cultures: bacterial, fungal and mycobacterial (Sputum for Xpert MTB/Rif)
- Autoimmune screening: RF, ANA, ANCA, if connective tissue disease suspected

Consider if history suggests

- Sweat chloride test for cystic fibrosis
- Workup for PCD
- HIV screening in relevant cases
- Bronchoscopy in localized disease when foreign body/ endobronchial obstruction is suspected

Imaging

- Initial: Chest X-ray (low sensitivity)
- Confirmatory: High-resolution CT (HRCT)

Severity Scoring

- Bronchiectasis Severity Index (BSI): preferred, includes exacerbation history and predicts mortality/hospitalizations
- FACED Score: simpler, does not include exacerbations
- Pulmonary Function Tests (PFTs): FEV_1 and obstruction pattern, is important for severity, treatment and prognosis

3.Management of Stable Bronchiectasis

Goals of Management

- Improve sputum clearance
- Reduce cough, dyspnea, and fatigue
- Minimize exacerbation frequency
- Preserve lung function
- Enhance quality of life
- Educate and empower the patient

Airway Clearance Techniques (ACTs)

Airway clearance techniques (ACTs) are recommended for all patients with bronchiectasis, including those with predominantly dry cough if imaging shows mucus plugging. Techniques should be intensified during exacerbations, and both method and device selection should be individualized.

Recommended Techniques

- Active cycle of breathing techniques (ACBT)
- Oscillating PEP devices: Flutter, Acapella, Aerobika
- Postural drainage (gravity-assisted where possible)

Best Practices

- Should be individualized based on disease severity and sputum load
- Frequency: once to twice daily; increase during exacerbations
- Use of adjuncts: hypertonic saline nebulization, bronchodilators

Pharmacological Management

Antibiotics

Eligibility for long-term preventive antibiotic therapy (macrolides or inhaled antibiotics):
HIGH RISK of exacerbations despite optimized standard care (≥2 exacerbations in the prior 12 months OR ≥1 severe exacerbation OR ≥1 exacerbation plus severe daily symptom burden).

Choice of agent:

- Chronic *Pseudomonas aeruginosa* infection: long-term inhaled antibiotics colistin, or tobramycin or gentamicin OR long-term macrolides as first-line options (individualize by risk–benefit, preference, access).
- Chronic infection with pathogens other than P. aeruginosa: long-term macrolides (azithromycin 250–500 mg three times per week); reassess efficacy/tolerability at 6–12 months; discontinue if ineffective or poorly tolerated.

Monitoring

- Perform sputum cultures before initiation
- Assess for hearing, renal function, and QT prolongation (macrolides)

Mucolytics and Bronchodilators

Mucoactives:

- Hypertonic saline (3%–7%) improves sputum clearance
- Isotonic saline (0.9%) for sensitive airways
- Avoid recombinant human DNase (increases exacerbations in non-Cf bronchiectasis)

Bronchodilators:

- LABA (preferable) or LAMA for: Coexisting COPD/asthma, Significant breathlessness and cough even without asthma or COPD
- Try long-acting bronchodilators even without confirmed reversibility
- Inhaler technique and adherence must be checked regularly

Anti-inflammatory Medications

- ICS: do NOT offer long-term ICS to bronchiectasis patients without coexisting asthma or COPD.
- Continue ICS only for established indications (e.g. asthma, COPD and ABPA).
- Brensocatib (DPP-1 inhibitor) may be considered if available, in adults with bronchiectasis who experience frequent exacerbations despite standard therapy.
- Avoid: long-term oral steroids, PDE4 inhibitors, leukotriene receptor antagonists, and statins due to lack of benefit and risk

Vaccination Strategies

- Annual Influenza Vaccine
- Pneumococcal Vaccine: PCV-13 (once) and (PPV-23) recommended once every 5–10 years
- COVID-19 Vaccine

Pulmonary Rehabilitation Programs

- Include supervised exercise training, education on disease and airway clearance, nutritional advice, and psychological support
- Indicated for: Dyspnea (MMRC ≥1), Deconditioning, Recurrent Exacerbations
- Tools: 6-minute walk test (6MWT), to assess pre- and post-rehabilitation outcomes

4. Management of Exacerbations

Definition

An exacerbation of bronchiectasis is defined by an acute deterioration in ≥3 of the following for ≥48 hours: Increased cough, Increased sputum volume or purulence, Worsening breathlessness or exercise intolerance, Hemoptysis, Fatigue or malaise

Antibiotic Selection and Duration

- Start empirical therapy while awaiting cultures. Tailor based on prior microbiology
- Standard duration: 10–14 days

***Pseudomonas* Management**

- First-line: Ciprofloxacin PO 500–750 mg BID for 14 days
- If resistant or IV required: antipseudomonal beta-lactam + nebulized aminoglycoside (e.g., ceftazidime + tobramycin) or Piperacillin/Tazobactam or carbapenem
- For eradication after above oral or IV antibiotics continue inhaled / nebulized antibiotics (e.g., colistin /Gentamycin) for 3 months

Non-*Pseudomonas*

- Amoxicillin-clavulanate (1 gm Bid), or fluoroquinolones (levofloxacin 750 mg once daily for 10-14 days)
- Hospitalization Criteria: Respiratory distress, Hypoxia (SpO_2 <92%), Systemic features (e.g., sepsis, hypotension), Failure of oral antibiotics, Frailty or poor social support

Bronchodilator Therapy

Bronchodilators should be considered during acute exacerbations of bronchiectasis.

- SABA: Salbutamol 100–200 mcg via MDI with spacer every 4–6 hours as needed
- SAMA: Ipratropium bromide 20–40 mcg via MDI every 6 hours as needed
- Nebulized bronchodilators (SABA /SAMA or both) should be used in moderate-to-severe exacerbations or in patients unable to use inhalers properly.

Anti-inflammatory Therapy

- Systemic corticosteroids are recommended for acute exacerbations, especially if there is an overlap with asthma, COPD, allergic bronchopulmonary aspergillosis (ABPA).
- In such cases, a short course of oral corticosteroids (e.g., prednisolone 30–40 mg for 5–7 days) or IV Methyl prednisolone 20 mg twice/thrice daily may be beneficial.

5. Long-Term Management and Monitoring

- Identify HIGH-RISK groups (COPD, PCD, RA-overlap, chronic P. aeruginosa/enteric Gram-negatives, ≥2 exacerbations or ≥1 severe, severe daily symptoms with purulence, NTM, ABPA) and lower treatment thresholds accordingly.
- Screen/manage co-morbidities especially cardiovascular risk, osteoporosis, anxiety, depression, chronic rhinosinusitis, and GERD.

Monitoring

Annual (or more frequent) review with:

- Symptom assessment & BSI
- Sputum microbiology
- Spirometry
- Oxygen saturation / ABG (if hypoxemia)
- Imaging if clinical deterioration

Considerations

- Pulmonary Function:
  Decline suggests disease progression
- Oxygen Therapy:
  LTOT indicated chronic hypoxemia (same criteria as COPD)
- Non-Invasive Ventilation (NIV):
  Consider in hypercapric respiratory failure with frequent hospitalizations or poor sleep quality.

Patient Education

- Exacerbation action plans
- Correct inhaler technique
- Importance of airway clearance
- Smoking cessation and lifestyle advice
- Vaccinations

Surgical Options

Surgical resection should be considered in:

- Localized disease with recurrent infection despite maximal therapy
- Massive or recurrent hemoptysis
- Suspicion of malignancy or foreign body

Treatment of Treatable Trait

- Personalized treatment according to etiology like (asthma, COPD, ABPA, CF, autoimmune disease etc.).

Chapter 02:
Introduction

Bronchiectasis is a chronic respiratory disease characterized by permanent, abnormal dilation of the bronchi, leading to recurrent infections, chronic inflammation, and progressive lung damage. Globally, the burden of bronchiectasis is significant, with varying prevalence across regions due to differences in etiology, healthcare access, and environmental factors [1]. In Pakistan, bronchiectasis remains a major yet underrecognized public health concern, contributing to substantial morbidity and economic burden due to frequent hospitalizations and long-term antibiotic use [2,3].

The etiology of bronchiectasis in Pakistan is diverse, with idiopathic (unknown cause) bronchiectasis remaining the most common, followed by post-infectious causes such as tuberculosis and childhood pneumonia[2,3]. Other contributing factors include poor socioeconomic conditions, indoor air pollution, limited access to vaccinations, and delayed diagnosis due to inadequate healthcare infrastructure [4-6]. Additionally, the high prevalence of multidrug-resistant (MDR) tuberculosis[7] in Pakistan further complicates disease management, leading to worse clinical outcomes. Despite its significant impact, there is a lack of standardized national guidelines for bronchiectasis management in Pakistan, resulting in inconsistent diagnostic and therapeutic practices.

This guideline, developed by the Pakistan Chest Society, aims to provide evidence-based recommendations tailored to the local context, addressing diagnostic challenges, treatment strategies, and long-term management of bronchiectasis. It serves as a comprehensive resource for pulmonologists, general physicians, and healthcare professionals involved in respiratory care.

Methodology

This guideline has been developed by the Bronchiectasis Guideline Committee of Pakistan Chest Society (PCS) using the GRADE (Grading of Recommendations, Assessment, Development and Evaluation) approach to ensure transparent, rigorous, and evidence-based recommendations for the diagnosis, severity assessment, and management of bronchiectasis. The GRADE framework allows for clear distinction between the quality of evidence and the strength of recommendations, facilitating more informed clinical decisions [8].

Guideline development process

Panel Composition

The guideline panel included pulmonologists from all chapters of PCS, all with expertise in bronchiectasis and guideline development.

Scope Definition and Key Questions

The scope of the guideline was defined through stakeholder consultation. Clinical questions were formulated using the PICO (Population, Intervention, Comparison, Outcome) format to guide literature review and recommendation development.

This guideline includes a combination of **9 PICO-formatted questions** and **9 narrative questions,** ensuring a comprehensive approach to both evidence-based and context-specific clinical issues.

Evidence Retrieval and Appraisal

A systematic literature review was conducted using databases such as PubMed, Cochrane Library, and EMBASE. Priority was given to randomized controlled trials (RCTs), meta-analyses, and high-quality observational studies published between 1990 and 2024. Where available, evidence from low- and middle-income countries (LMICs), particularly Pakistan and South Asia, was emphasized.

Due to the limited availability of robust research specific to Pakistan, the majority of recommendations and referenced studies have been adapted from internationally accepted guidelines, notably the British Thoracic Society (BTS) 2019 [9] and the European Respiratory Society (ERS) 2025 guidelines [10]. These sources were critically appraised and modified to reflect the local epidemiological context, healthcare infrastructure, and resource availability. This methodology ensures that the PCS Bronchiectasis Guideline is both evidence-informed and contextually relevant, providing clinicians across Pakistan with practical, high-quality guidance for the diagnosis and management of bronchiectasis.

Quality of Evidence

Each body of evidence was appraised and rated using the GRADE system [8].

Grade	Evidence
1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well conducted meta-analyses, systematic reviews of RCTs, or RCTS with a low risk of bias
1-	Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2++	High quality systematic reviews of case-control or cohort studies or high-quality case-control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal
2+	Well conducted case-control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal
2-	Case-control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal
3	Non-analytic studies, for example, case reports, case series
4	Expert opinion

Formulation of Recommendations

Recommendations were derived based on:

- Balance of benefits and harms
- Quality of evidence
- Values and preferences of patients and clinicians
- Resource use and feasibility in the Pakistani healthcare context

Each recommendation was graded as follows

Strong (Grade A, B): Most individuals should receive the recommended course of action.

Conditional/Weak (Grade C, D): The best action may differ depending on circumstances or patient values.

Grade	Type of Evidence
A	At least one meta-analysis, systematic review, or RCT rated as 1++and directly applicable to the target population or A systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+directly applicable to the target population and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++directly applicable to the target population and demonstrate overall consistency of results or Extrapolated evidence from studies rated as 1++or 1+
C	A body of evidence including studies rated as 2+directly applicable to the target population and demonstrate overall consistency of results or Extrapolated evidence from studies rated as 2++
D	Evidence of level 3 or four or Extrapolated evidence from studies rates as 2+

Consensus

The draft recommendations were circulated among members of the guideline committee for feedback. Consensus was defined as ≥75% agreement.

Updates and Revisions

This guideline is intended to be reviewed every 3–5 years or sooner if significant new evidence emerges. It incorporates global standards while ensuring applicability to the local Pakistani healthcare environment.

Chapter 03:
Bronchiectasis: Diagnosis, Etiology and Severity Assessment

Narrative question # 1: When should clinicians suspect bronchiectasis, and what clinical features indicate the need for further evaluation?

Evidence Statement

Studies in healthy populations do not provide a strong body of evidence but suggest that persistent mucopurulent or purulent sputum production in the stable state is suspicious for underlying bronchiectasis, particularly if there is a past history of major respiratory infection (e.g., measles, whooping cough, pneumonia, tuberculosis) or ongoing rhinosinusitis (2-), COPD (2++), alpha one antitrypsin deficiency, (2+), asthma (2+), rheumatoid arthritis (2+), other connective tissue diseases (2-) and inflammatory bowel disease (2+) [9,10].

Recommendations

Consider investigation for bronchiectasis in patients with persistent production of mucopurulent or purulent sputum particularly with relevant associated risk factors like history of previous chronic infections, severe COPD, poorly controlled asthma, autoimmune disorder, inflammatory bowel disease and HIV. (Grade C)

Bronchiectasis: Diagnosis (Imaging)

Narrative question # 2: How is the diagnosis of bronchiectasis confirmed, and what is the role of imaging?

Evidence Statements

- Chest radiography (CXR) has limited sensitivity and specificity in diagnosing bronchiectasis particularly in mild disease [9]. (2+)
- High resolution CT scan has a high accuracy in diagnosing bronchiectasis [11]. (2+)
- CT scanning can also aid in identifying an etiology of bronchiectasis for example, ABPA, NTM, primary ciliary dyskinesia, alpha one antitrypsin deficiency, and a foreign body [11]

Recommendations

Perform baseline chest X-ray in patients with suspected bronchiectasis. (Grade D)
Perform a High-resolution CT to confirm a diagnosis of bronchiectasis when clinically suspected. (Grade B)

CT Features of Bronchiectasis

Bronchiectasis is defined by bronchial dilatation as suggested by one or more of the following:[11]

- Broncho-arterial ratio >1(internal airway lumen vs adjacent pulmonary artery)
- Lack of tapering
- Airway visibility within 1cm of costal pleural surface or touching mediastinal pleura.

The following indirect signs are commonly associated with bronchiectasis:

- Bronchial wall thickening
- Mucus impaction
- Mosaic perfusion/air trapping on expiratory CT

Figure 01

Cystic bronchiectasis in Anterior segment of RUL (Red Arrow), signet ring sign (Blue Arrow), bronchial wall thickening and mosaic attenuation (Yellow Arrow)

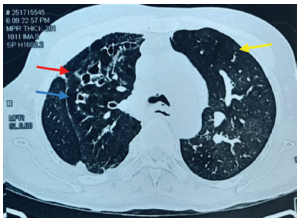


Figure 02

Localized cystic bronchiectasis (Red Arrow) in LLL, mosaic attenuation (Blue Arrow) and bronchial wall thickening

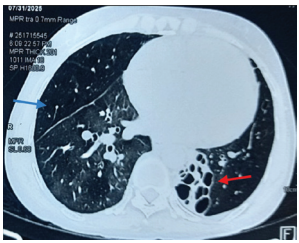


Figure 03

Varicoid bronchiectasis (Red Arrow) in posterior segment of RUL, bronchial wall thickening, lack of trapping (Blue Arrow) and mosaic attenuation (Yellow Arrow)

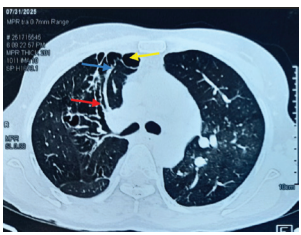


Figure 04

Bronchiectasis: Signet ring sign (Red Arrow), bronchial wall thickening (Blue Arrow), mosaic attenuation (Yellow Arrow)

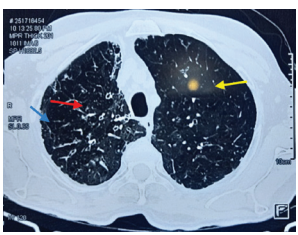


Figure 05

Bronchiectasis (Red Arrow) in posterior segment of RUL, mosaic attenuation (Yellow Arrow)

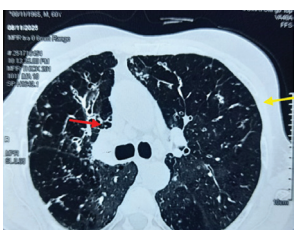
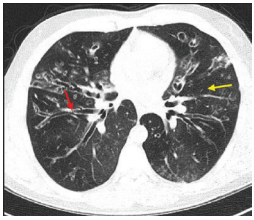


Figure 06
Bilateral tram track bronchiectasis (Red Arrow) and bronchial wall thickening (Yellow Arrow)



Bronchiectasis: Diagnosis of Etiology
Narrative question # 3: How can underlying causes of bronchiectasis be identified?

Evidence Statements

- It is sometimes possible to define an etiological cause for bronchiectasis which directly alters management through the use of a standard panel of investigations [9,10]. (2++)
- Allergic bronchopulmonary aspergillosis (ABPA) occurs in 4% (range 1%–8%) of patients with bronchiectasis [12] (2+)
- A diagnosis of ABPA is supported by total IgE >500IU/mL (ku/L) and either positive Aspergillus-specific IgE or immediate reaction on skin prick testing [12].
- Antibody deficiency syndromes are found in 7% (range 2%–17%) of patients with bronchiectasis [13]. (2+)
- Cystic fibrosis is diagnosed in 3%–4% of adult patients with bronchiectasis [13]. (1+)
- Primary ciliary dyskinesia is diagnosed in the majority of studies in ≤5% of adult patients with bronchiectasis [13]. (1+)
- There is little evidence to support routine testing for autoimmune disease or alpha one antitrypsin deficiency in the absence of suggestive clinical features [10]. (2++)
- Serum rheumatoid factor is frequently positive in patients with bronchiectasis (2+) but the clinical significance of this is uncertain [13].
- Aspiration is often associated with bronchiectasis (2+) and may be causally related.

Recommendations

- Based on history and examination, a panel of investigations should be performed to establish the underlying cause of bronchiectasis. (Grade A)
- Co-morbidities and past medical history should be recorded in patients diagnosed with bronchiectasis to identify relevant and possibly causative disease such as rheumatoid arthritis, COPD, asthma, gastro-esophageal reflux disease and inflammatory bowel disease. (Grade B)
- Blood tests should be done at diagnosis: Serum IgG/IgA/IgM, total IgE, Aspergillus-specific IgE AND IgG, CBC including eosinophils count. (Grade A)
- Sputum cultures should be performed in all patients with bronchiectasis for bacterial, fungal, mycobacterial culture (for TB and NTM) and Xpert MTB/Rif (Gene Xpert) [9]. (Grade A)
- Consider testing RF, anti CCP, ANA and ANCA in patients with coexisting clinical features of arthritis, connective tissue disease and/or systemic vasculitis. (Grade D)
- Test for cystic fibrosis (quantitative sweat chloride) in patients with supporting clinical features, for example, early onset, male infertility, malabsorption, pancreatitis. (Grade B)

- Test for PCD (according to ERS Guidelines for PCD Diagnosis) in patients with supporting clinical features, including a history of neonatal distress, symptoms from childhood,
- recurrent otitis media, rhinosinusitis, or infertility. (Grade B)
  Consider testing for A1AT deficiency in patients with coexisting basal panacinar emphysema. (Grade D)
- Consider bronchoscopy for patients with localized disease to rule out an endobronchial lesion or foreign body as the cause of bronchiectasis. (Grade D)
- A bronchial aspiration or bronchial wash targeting the areas of bronchiectasis from CT scan of the chest should be considered in patients who do not expectorate and can be particularly helpful in the diagnosis of TB and NTM pulmonary disease. (Grade C)

Bronchiectasis: Severity Scoring

Narrative question # 4: In patients with bronchiectasis, which clinical scoring tool is effective for assessing disease severity?

Evidence Statements

- The availability of the two clinical scoring systems, the Bronchiectasis Severity Index (BSI) (table1) [14] and FACED (table 2) [15], has increased our ability to predict future mortality in patients with bronchiectasis.
- The BSI additionally provides information on morbidity, hospital admissions and exacerbations. The major limitation of the FACED score is the absence of exacerbation which is regarded by many clinicians as the most important modifiable marker of severity. Prior exacerbations are also the strongest predictor of future exacerbations. which explains why several studies have found FACED to be poorly predictive of future morbidity [10, 16-18]

Recommendation

- Consider using any of the severity scores for assessment of severity. FACED is simple and easy to use while bronchiectasis severity index (BSI) is a better predictor of future exacerbation and outcome. (Grade B)
- While severity scoring systems are useful, they have limitations and may lead to misclassification, potentially resulting in under- or overtreatment. Therefore, clinical features such as frequent exacerbations, severe daily symptoms, chronic Pseudomonas aeruginosa infection, specific underlying causes, and comorbid conditions should guide decisions regarding the need for closer monitoring and more intensive management. (Grade B)
- Pulmonary function tests (PFTs) are used as an objective measure for functional assessment and severity in bronchiectasis and should be done in stable condition. (Grade C)
- Obstructive impairment is seen most frequently in bronchiectasis. and it is associated with higher risk of colonization with pseudomonas infection. The presence of obstruction is one of the poor prognostic indicators [9]

Table 1 Variables involved in calculating the severity score in the Bronchiectasis severity index (BSI)

0-4=mild disease; 5–8=moderate disease; 9 and over=severe disease. (total score 24)

Factors and points for scoring system				
Age (years)	<50 (0 points)	50–69 (2 points)	70–79 (4 points)	>80 (6 points)
BMI (kg/m2)	<18.5 (2 points)	18.5–25 (0 points)	26–30 (0 points)	>30 (0 points)
FEV 1% predicted	>80 (0 points)	50–80 (1 point)	30–49 (2 points)	<30 (3 points)
Hospital admission within last 2 years	No (0 points)			Yes (5 points)
Number of exacerbations in previous 12 months	0 (0 points)	1–2 (0 points)	≥3 (2 points)	
MRC breathlessness score	1–3 (0 points)	4 (2 points)	5 (3 points)	
P. aeruginosa colonization	No (0 points)		Yes (3 points)	
Colonization with other organisms	No (0 points)		Yes (1 point)	
Radiological severity	<3 lobes affected (0 points)	≥3 lobes or cystic bronchiectasis in any lobe (1 point)		

Table 2 Variables involved in calculating severity in the FACED score
0–2 Points=mild disease; 3–4=moderate disease; 5–7=severe disease.

Factors and points for scoring system		
FEV 1% predicted	<50 (2 points)	≥50 (0 points)
Age (years)	≤70 (0 points)	>70 (2 points)
Colonization by P. aeruginosa	No (0 points)	Yes (1 point)
Radiological extension of bronchiectasis	1–2 lobes (0 points)	>2 lobes (1 point)
Modified MRC dyspnea scale	1–2 (0 points)	III-IV (1 point)

Chapter 04: Management of Bronchiectasis

Management of Stable Bronchiectasis and Exacerbation Prevention

Goals of Management

- Improve sputum clearance
- Reduce cough, dyspnea, and fatigue
- Minimize exacerbation frequency
- Preserve lung function
- Enhance quality of life
- Educate and empower the patient

PICO # 1: In adults with bronchiectasis, do the use of airway clearance techniques improve clinical outcomes compared to no airway clearance technique?

P: Patients with bronchiectasis

I: Airway clearance techniques (e.g., postural drainage, percussion, PEP devices, autogenic drainage)

C: No airway clearance or conventional physiotherapy alone

O: Improved sputum clearance, reduced exacerbations, and better lung function

Evidence Statement

- Specific studies from Pakistan on the use of pulmonary rehabilitation and ACTs in non-CF bronchiectasis are very limited. However, a systematic review on rehabilitation service models for people with physical disabilities in LMICs suggests that tailored rehabilitation programs can be effective in these settings [19]. (2+)
- Regular twice daily respiratory physiotherapy increases sputum expectoration, improves cough-related health status, quality of life and exercise capacity in individuals with stable bronchiectasis and chronic sputum expectoration [9,10] (1-)
- The active cycle of breathing techniques plus postural drainage enhances the quantity of sputum expectorated compared with the active cycle of breathing techniques in the sitting position or oscillating positive expiratory pressure (Acapella /Flutter) in the sitting position [9,10]. (1-)

Recommendation

- At initial assessment, a respiratory physiotherapist should educate the patient about their condition and if appropriate give advice on adjuncts (inhaled/oral therapy or exercise) that may enhance effectiveness of their chosen airway clearance technique. (Grade A)
- Advise all individual for daily active cycle of breathing techniques plus postural drainage. (Grade A)
- Advise individuals to perform their airway clearance technique for a minimum of 10 minutes (up to a maximum of 30 minutes). (Grade B)

PICO # 2: In adults with bronchiectasis, does the use of mucoactive drugs improve clinical outcomes compared to no mucoactive therapy?

P: Patients with bronchiectasis

I: Use of mucoactive agents

C: No mucoactives or standard airway clearance alone

O: Enhanced mucus clearance, reduced exacerbations, and improved quality of life

Evidence Statement

- Despite an extensive search, specific studies from Pakistan, India, Bangladesh, and African countries focusing on the use of inhaled hypertonic saline or mannitol in bronchiectasis were not identified.
- Existing studies suggest potential benefits of inhaled hypertonic saline and mannitol in mucus clearance and cough related quality of life QoL but their impact on reducing exacerbations in non-CF bronchiectasis is not well-established [20]. (1-)
- Erdosteine has demonstrated benefits in chronic bronchitis and COPD, but evidence in bronchiectasis remains limited. Short-term studies suggest potential benefits, but long-term safety and efficacy are uncertain [21]. (1-)
- Recombinant human DNase increases exacerbation frequency in non-CF bronchiectasis [9,10]. (1+)
- Oral mucolytics can improve sputum expectoration [9]. (1-)

Recommendations

- Consider a trial of mucoactive treatment (inhaled/nebulized 3% or 5% hypertonic saline) in patients with bronchiectasis who have difficulty in sputum expectoration or where airway clearance has failed to control symptoms. (Grade C)
- Consider pre-treatment with a bronchodilator prior to inhaling or nebulized mucoactive treatments especially in individuals where bronchoconstriction is likely (patients with asthma or bronchial hyper-reactivity and those with severe airflow obstruction FEV1 <1L). Regularly assess patients for potential side effects, such as bronchospasm or cough, and evaluate the clinical effectiveness of the therapy. (Grade C)
- Consider Erdosteine for patients with frequent exacerbations despite optimized standard care. Prescribe for limited periods with periodic re-evaluation. (Grade D)
- Do not routinely use recombinant human DNase in adults with non CF bronchiectasis [9]. (Grade A)

PICO # 3: In adults with bronchiectasis, does the use of inhaled bronchodilators improve clinical outcomes compared to no bronchodilator therapy?

P: Patients with bronchiectasis (with or without airway obstruction)

I: Inhaled bronchodilators (e.g., β2-agonists, anticholinergics)

C: No bronchodilator use

O: Symptom relief, reduction in exacerbations, improvement in lung function, quality of life and exercise tolerance

Evidence Statement

- A comprehensive search was conducted to identify studies from the past 30 years assessing the efficacy and safety of bronchodilator therapy in preventing exacerbations among adults with non-CF bronchiectasis, with a focus on studies from Pakistan.
- A retrospective study from Aga Khan University in Pakistan found that obstructive impairment was the most common spirometry pattern (68.9%) in bronchiectasis patients, but it did not specifically evaluate bronchodilator therapy efficacy [3]. (2-)
- Patients with bronchiectasis may benefit from bronchodilators, presumably by reversing bronchospasm (2-).
- Bronchodilator treatment may include short or long-acting beta-agonists, short or long-acting anti-cholinergic bronchodilators, or combined bronchodilators. There is no evidence to guide which of these is the optimal strategy in bronchiectasis (4).

Recommendations

- Consider bronchodilator therapy as part of a holistic management plan, including airway clearance and infection control. (Grade C)
- Use of inhaled long-acting bronchodilators in patients with bronchiectasis and co-existing COPD or asthma should follow the guideline recommendations for COPD or asthma. (Grade B)
- Offer a trial of inhaled long-acting bronchodilator therapy (preferably LABA) or LABA +LAMA in patients with symptoms of significant breathlessness. (Grade D)

PICO # 4: In adults with bronchiectasis, does long-term use of anti-inflammatory therapies improve clinical outcomes compared to no anti-inflammatory treatment?

P: Patients with bronchiectasis

I: Anti-inflammatory therapies

C: No anti-inflammatory treatment or placebo

O: Reduction in airway inflammation, frequency of exacerbations, and symptom burden

Evidence Statement

- Despite an extensive search, specific studies from Pakistan, on the use of inhaled corticosteroids to reduce exacerbation in bronchiectasis were not identified, so evidence from recent ERS 2025 [10] guideline were used.
- The ERS 2025 guidelines reviewed data from Six RCTs, including one crossover study, and assessed various ICS regimens (beclomethasone, budesonide, fluticasone, and beclomethasone-formoterol). Across these trials, ICS use showed no significant reduction in exacerbation frequency or proportion of patients with exacerbations compared to placebo or no treatment (MD -0.2; OR 0.89). Similarly, no meaningful differences were observed in 24-hour sputum volume (MD -3.37) or FEV_1 (MD 0.03). There were also no significant effects identified for health-related quality of life [10]. (2+)
- There is insufficient evidence to evaluate the role of oral corticosteroids, PDE4 inhibitors, methylxanthines or leukotriene receptor antagonists in bronchiectasis [9]. (2+)

- Brensocatib, an oral, reversible inhibitor of dipeptidyl peptidase 1 (DPP-1), FDA approved now, has demonstrated significant clinical benefit in reducing exacerbations in patients with non-CF bronchiectasis. Phase 3 ASPEN trial showed that both 10 mg and 25 mg daily doses of Brensocatib significantly reduced the annualized rate of exacerbations compared to placebo (rate ratios: 0.79 and 0.81, respectively; $P < 0.01$), with a higher proportion of patients remaining exacerbation-free at 52 weeks [22]. (1+)

Recommendations

- Do not routinely offer inhaled corticosteroids to patients with bronchiectasis without other indications (such as ABPA, chronic asthma, COPD, and ABPA). (Grade B)
- Consider triple inhaled therapy (ICS+LABA+LAMA) for bronchiectasis patients with frequent exacerbations or persistent symptoms due to bronchospasm, especially in those with underlying COPD, ABPA or asthma. (Grade C)
- Do not offer long-term oral corticosteroids for patients with bronchiectasis without other indications (such as ABPA, inflammatory bowel disease or autoimmune disorder). (Grade A)
- Brensocatib may be considered in adults with bronchiectasis who experience frequent exacerbations despite standard therapy, particularly in those with evidence of neutrophilic inflammation. Long-term safety and cost-effectiveness should be evaluated on a case-by-case basis. (Grade C)
- Do not routinely offer PDE4 inhibitors, methylxanthines or leukotriene receptor antagonists for bronchiectasis treatment. (Grade B)

PICO # 5: In adults with bronchiectasis, does the use of long-term inhaled antibiotics reduce the frequency of exacerbations compared to no inhaled antibiotic therapy?

P: Patients with bronchiectasis

I: Long-term inhaled antibiotic treatment

C: No long-term inhaled antibiotic treatment or symptomatic treatment only

O: Reduced exacerbations, improved lung function, and enhanced quality of life

Evidence Statement

- Patients at high risk of exacerbations include patients with a history of 2 or more exacerbations in the prior year OR 1 severe exacerbation OR 1 exacerbation plus severe daily symptoms [10].
- Clinical features associated with a higher risk of future exacerbations include P. aeruginosa infection, PCD, COPD, RA and sputum purulence [10].
- Despite an extensive search, specific studies from Pakistan, on the use of inhaled antibiotics to reduce exacerbation in bronchiectasis were not identified, so evidence from recent ERS 2025 guidelines were used [10].
- The ERS 2025 guidelines analyzed 18 RCTs on inhaled antibiotics for bronchiectasis. Thirteen trials showed a 20% reduction in exacerbation rates (rate ratio 0.80; 95% CI 0.70–0.92), and overall, the risk of at least one exacerbation fell by 15% (risk ratio 0.85; 95% CI 0.76–0.94). Eight studies reported a 43% decrease in severe exacerbations (rate ratio 0.57; 95% CI 0.35–0.94), while pooled data from 14 trials indicated prolonged time to first exacerbation (hazard ratio 0.81; 95% CI 0.71–0.93) [10]. (1+)

- Analysis of 15 studies found no significant difference in treatment-emergent adverse events between inhaled antibiotics and controls (OR 1.04; 95% CI 0.81–1.35), nor in all-cause mortality (OR 1.04; 95% CI 0.57–1.89) [10]. (1+)
- Inhaled antibiotics showed no meaningful improvement in patient-reported outcomes. Across 11 studies, changes in QoL-B respiratory symptom scores were small and not statistically significant (MD 2.14; 95% CI 0.28–4.57). Similarly, eight studies reported no significant change in SGRQ total scores (MD 2.63; 95% CI -5.37–0.1) [10]. (1+)

Recommendations (Figure 7)

Pseudomonas aeruginosa colonized patients

- Chronic infection with Pseudomonas aeruginosa is defined by at least two positive sputum cultures, separated by at least three months over a one-year period, in a clinically stable patient [9].
- Offer long-term inhaled antibiotics to patients with chronic Pseudomonas aeruginosa infection and a high risk of exacerbations despite optimized standard care. (Grade A)
- Use inhaled colistin (200,000 to 300,000 IU) twice daily or gentamicin (80 mg twice daily) for patients with bronchiectasis and chronic P. aeruginosa infection [9].
- Treatment sequencing: bronchodilator → mucoactive → ACT → inhaled antibiotic (10).

Non-*P. aeruginosa* colonized patients

- Consider long-term inhaled antibiotics for patients with chronic infection by non-*Pseudomonas aeruginosa* pathogens and a high risk of exacerbation despite optimized standard care. (Grade C)

Prior to starting long term inhaled aminoglycosides, for safety reasons

- Avoid using if creatinine clearance <30mL/min.
- Use with caution if the patient has significant hearing loss needing hearing aids or significant balance issues.
- Avoid concomitant nephrotoxic medications.
- **Counsel patients about potential major side effects with long term antibiotics and seek urgent attention if these develop.**
- **Duration:** Long term treatment is defined as a minimum of 3 months, but most available data is over 12 months [10].
- Review patients on long term inhaled antibiotics 3 monthly with assessment of efficacy, toxicity and continuing need. Monitor sputum culture and sensitivity regularly, although vitro resistance may not affect clinical efficacy [9].

PICO # 6: In adults with bronchiectasis, does long-term use of oral macrolide antibiotics reduce the frequency of exacerbations compared to no macrolide therapy?

P: Patients with bronchiectasis

I: Long-term oral antibiotic (macrolides) treatment

C: No long-term inhaled antibiotic treatment or symptomatic treatment only

O: Reduced exacerbations, improved lung function, and enhanced quality of life

Evidence Statement

- Despite an extensive search, specific studies from Pakistan, on the use of long-term oral (macrolides) to reduce exacerbation in bronchiectasis were not identified, so evidence from recent ERS 2025 guideline were used [10].
- The ERS 2025 guidelines reviewed nine RCTs on long-term macrolide therapy in bronchiectasis. Meta-analysis of four studies showed a 52% reduction in exacerbation rates with macrolides (HR 0.48; 95% CI 0.37–0.62). Five trials reported a 36% lower risk of experiencing an exacerbation (RR 0.64; 95% CI 0.46–0.89), and two studies demonstrated a significantly longer time to first exacerbation (HR 0.32; 95% CI 0.21–0.47) [10]. (1++)
- Seven studies showed a clinically meaningful improvement in health-related quality of life with macrolide therapy, reflected by an average 7.26-point reduction in SGRQ scores (MD -7.26; 95% CI -10.94 to -3.59) [10]. (1+)
- Two studies found no significant differences in antimicrobial resistance (OR 1.08; 95% CI 0.22–5.19) or emergence of new pathogens (OR 0.82; 95% CI 0.41–1.63). Six trials reported similar adverse event rates between groups (OR 0.86; 95% CI 0.53–1.39) [10]. (1+)
- Three small studies reported low mortality with no significant differences between groups; one study found no notable difference in hospitalization rates (OR 0.45; 95% CI 0.04–5.19) [10]. (2+)

Recommendations (Figure 7)

***Pseudomonas aeruginosa* colonized patients:**

- Chronic infection with *Pseudomonas aeruginosa* is defined by at least two positive sputum cultures, separated by at least three months over a one-year period, in a clinically stable patient.[9]
- Offer long-term macrolide therapy to patients at high risk of exacerbations despite optimized standard care. (Grade A)
- Offer long-term macrolides to patients with high exacerbation risk, regardless of whether they are colonized with *Pseudomonas aeruginosa* or other pathogens. (Grade A)
  Use Azithromycin 250 mg or 500 mg on alternate days, as long term treatment.
- **Duration:** The optimal duration of macrolide therapy is unknown, with the longest study
- being up to 12 months. (Grade A)
  Review patients on long term macrolide 3 months with assessment of efficacy, toxicity and continuing need.

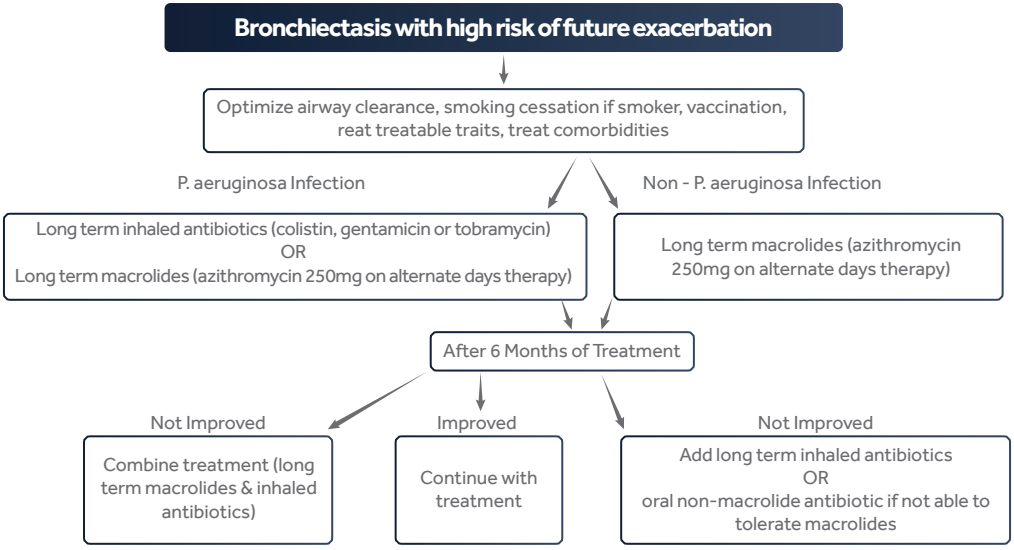
Prior to starting long term macrolides, for safety reasons:

- Ensure no active NTM infection with at least one negative respiratory NTM culture [9,10].
- Use with caution if the patient has significant hearing loss needing hearing aids or significant balance issues.
- Macrolides may cause QT-time abnormalities, so it is better to get baseline ECG and repeat periodically if needed.
- Counsel patients about potential major side effects with long term macrolides and seek urgent attention if these develop.

- If long-term macrolide cannot be used due to contraindication/inefficacy with clear chronic infection and high exacerbation risk, consider doxycycline 100mg OD as an alternative. [9]. (Grade C)

Figure 07

Algorithm for long-term antibiotic treatment in patients with bronchiectasis. (Adopted and modified from ERS Bronchiectasis guideline 2025 [10]



PICO # 7: In bronchiectasis patients with newly isolated *Pseudomonas aeruginosa*, does eradication therapy improve outcomes compared to no eradication treatment?

P: Patients with bronchiectasis who have a newly isolated *Pseudomonas aeruginosa*.

I: Targeted eradication therapy (e.g., antibiotics)

C: No eradication or standard care without targeted therapy

O: Improved clinical outcomes (e.g., reduced exacerbations, better lung function, delayed disease progression, improved quality of life, decreased mortality)

Evidence Statements

- Despite an extensive search, specific studies from Pakistan, on *Pseudomonas aeruginosa* eradication therapy in bronchiectasis were not identified, so evidence from recent ERS 2025 guideline were used [10].
- The ERS 2025 guidelines reviewed six studies, five observational and one randomized trial comparing two eradication regimens (analyzed as before-and-after). Pooled data showed approximately 40% eradication success at 12 months. Additionally, three studies reported fewer exacerbations and/or hospital admissions in the year following eradication therapy 10.

Recommendations

- Offer eradication antibiotic therapy to patients with bronchiectasis who exhibit clinical

deterioration and a new isolation or regrowth of Pseudomonas aeruginosa after a prolonged period of non-detection. (Grade C)

- First line treatment option: ciprofloxacin 500–750mg bd for 2 weeks followed by a 3 month course of nebulized colistin (2MU BD), gentamicin (80 mg BD) or tobramycin (150 mg Bd). (Grade C)
- Second line treatment: IV anti-pseudomonal beta-lactam for 2 weeks (Intravenous Ceftazidime 2G TDS or Piperacillin with tazobactam 4.5G QID or Meropenem 2G TDS followed by a 3 months course of nebulized colistin, gentamicin or tobramycin. (Grade C)
  Perform sputum cultures after completion of eradication therapy (at 3 months) and again at 12 months to confirm treatment success. (Grade C)
  Routine eradication therapy is not advised for pathogens other than Pseudomonas aeruginosa due to lack of supporting evidence. (Grade B)

PICO # 8: In adults with bronchiectasis, does pulmonary rehabilitation improve clinical outcomes compared to no rehabilitation?

P: Patients with bronchiectasis
I: Pulmonary rehabilitation programs (including exercise training and education)
C: Usual care without rehabilitation
O: Improved exercise tolerance, quality of life, and reduced dyspnea

Evidence Statements

- Pulmonary rehabilitation increases exercise capacity and can improve quality of life in individuals with bronchiectasis [9]. (1+)
- Despite an extensive search, specific studies from Pakistan, pulmonary rehabilitation therapy in bronchiectasis were not identified, so evidence from recent ERS 2025 guideline were used [10].
- The ERS 2025 guidelines reviewed seven studies and concluded that pulmonary rehabilitation significantly enhances exercise capacity in bronchiectasis compared to usual care. Post-intervention improvements exceeded clinically important thresholds for the 6-minute walk test (MD 41.13 m) and incremental shuttle walk test (MD 72.83 m). Gains in daily step count and reduced breathlessness (mMRC) were also observed; however, most studies reported no sustained benefits at follow-up [10]. (1+)
- One study reported 74% lower odds of experiencing at least one exacerbation during follow-up in the pulmonary rehabilitation group compared to usual care (OR 0.26; 95% CI 0.08–0.81). No significant effect on mortality was observed, and severe exacerbations were not assessed [10]. (2+)
- 6MWT is a reliable and responsive outcome measures for use in bronchiectasis to evaluate exercise capacity pre and post pulmonary rehabilitation [23]. (2-)

Recommendations

- Offer pulmonary rehabilitation to individuals who are functionally limited by shortness of breath (Modified Medical Research Council (MMRC) Dyspnea Scale≥1) with and/or impaired exercise capacity. (Grade A)
- Consider the use of inspiratory muscle training in conjunction with conventional pulmonary rehabilitation to enhance the maintenance of the training effect. (Grade B)

- Consider the 6MWT when evaluating exercise capacity pre/post pulmonary rehabilitation in bronchiectasis. (Grade C)
- Pulmonary rehabilitation providers should offer education sessions tailored to the needs of individuals with bronchiectasis (e.g., airway clearance techniques, the pathophysiology of bronchiectasis and relevant inhaled therapy). (Grade C)

PICO # 9: In adults with bronchiectasis, does vaccination with influenza and pneumococcal vaccines improve clinical outcomes compared to no vaccination?

P: Adults with non-CF bronchiectasis
I: Annual influenza vaccination and pneumococcal vaccination
C: No vaccination
O: Reduction in respiratory infections and exacerbations

Evidence Statements

- A randomized open-label trial of 167 adults with chronic lung disease, including bronchiectasis, compared combined PPV-23 and influenza vaccination versus influenza vaccine alone. Dual vaccination significantly reduced acute infective respiratory exacerbations (OR 0.48; 95% CI 0.26–0.88), with a number needed to treat of 6 (95% CI 4–32) over two years. [24]. (1+)

Recommendations

- Healthcare providers should implement pneumococcal (PCV 13) and annual influenza vaccination programs for patients with bronchiectasis to reduce the risk of respiratory infections and exacerbations. (Grade C)
- Educate patients on the importance of receiving these vaccinations and address any concerns to enhance adherence and effectiveness.

Management of Exacerbation and Active Infection

Bronchiectasis exacerbation is an acute clinical deterioration, manifesting with at least three of the following symptoms over ≥48 hours [25]

- Cough
- Sputum volume and/or consistency
- Sputum purulence
- Breathlessness and/or exercise intolerance
- Hemoptysis

Severe exacerbation: Defined as an episode requiring hospitalization or intravenous antibiotics, and include tachypnea, acute or acute-on-chronic respiratory failure, hypercapnia, hemoptysis, new signs of cor pulmonale, hemodynamic instability, or impaired cognitive function [10].

Narrative question # 5: What diagnostic evaluations and therapeutic interventions are recommended for managing bronchiectasis exacerbations?

Evidence Statements

- Current guideline recommendations rely largely on expert consensus and established clinical practice rather than high-quality trials, resulting in low certainty of evidence [10].
- Most studies suggest airway pathogens remain stable during exacerbations; antibiotic therapy primarily aims to relieve symptoms by reducing bacterial load rather than eradicating chronic infection [10].
- The mainstay of therapy for bronchiectasis exacerbations is antimicrobial treatment [9,10].
- Cohort studies showed that in patients that needed intravenous antibiotic therapy according to guidelines, they had a good clinical response. There was, however, no control group that did not receive antibiotic therapy [9]. (2-)

Recommendations

- There should be prompt treatment of exacerbations with antibiotics (Table 3).(Grade B)
- Where possible, sputum (spontaneous or induced) should be obtained for culture and sensitivity testing prior to commencing antibiotics. (Grade B)
- In general, antibiotic courses for 14 days are standard and should always be used in patients infected with P. aeruginosa. Shorter courses may suffice in patients with mild bronchiectasis. (Grade C)
- Intravenous antibiotics should be considered when patients are particularly unwell, have resistant organisms or have failed to respond to oral therapy. (Grade C)
- The initial antibiotic selection is guided by any sputum culture results obtained within the past 12 to 24 months as well as prior patient experience. (Grade C)

No recent sputum culture data available

- For those without culture information, a fluoroquinolone (e.g., levofloxacin 750mg PO OD, Ciprofloxacin 750 mg twice daily) for 14 days is a reasonable, broad spectrum therapeutic option. (Grade D).

Recent sputum culture with sensitive organisms

For patients whose sputum cultures do not show beta-lactamase-positive H. influenzae, or streptococcus pneumonae, reasonable initial antibiotic choices include either amoxicillin 500 mg or amoxicillin-clavulanate three times daily or doxycycline 100 mg twice daily based on typical colonization and local antibiotic resistance patterns for 14 days. (Grade C).

Recent sputum culture with non-pseudomonal beta-lactamase-positive organism

- In the presence of Moraxella catarrhalis or beta-lactamase producing H. influenzae, oral antibiotic choices include amoxicillin-clavulanate 625mg TID, a second or third generation cephalosporin(Cefpodoxime 200 mg twice daily or ceftriaxone 2g OD), or a fluoroquinolone (levofloxacin 750mg OD, moxifloxacin 400mg OD) for 10-14 days [9]. (Grade D)

Prior sputum-growing Pseudomonas aeruginosa

- In the absence of known resistance to quinolones, the usual initial antibiotic choice is ciprofloxacin, 500 to 750 mg twice daily for 14 days. (Grade C)
- However, if the patient has had prior courses of ciprofloxacin, quinolone resistance often

necessitates administration of intravenous antibiotics. Examples include piperacillin tazobactam 4.5g TDS, a 4th generation cephalosporin (cefepime 2g BD or ceftazidime 2g TDS), a carbapenem (meropenem 2g TDS or imipenem 500mg QID), for 10-14 days. (Grade C)

Clinical worsening despite outpatient treatment

- Patients with bronchiectasis demonstrated evidence of severe infection, sepsis, or impending respiratory failure, significant hemoptysis should receive broad-spectrum intravenous antibiotics covering both Pseudomonas and methicillin resistant Staphylococcus aureus (MRSA) while awaiting culture data. (Grade D)
- Typical regimens use vancomycin 1g BD or linezolid 600mg BD for MRSA and an antipseudomonal penicillin (Piperacillin/Tazobactam 4.5 TDS, third generation cephalosporin (Ceftazidime 2g TDS) carbapenem (Meropenem 2g TDS), for Pseudomonas [9]. (Grade C)
- Once the patient has stabilized and results of initial cultures are available, the antibiotic regimen can be narrowed to a sensitive antibiotic with the fewest side effects.
- For patients with resistant organisms such as P. aeruginosa or requiring intravenous antibiotics, a 14-day course is recommended. (Grade C)

Airway clearance

- All patients with exacerbations should maintain or increase their airway clearance regimen to facilitate sputum removal and prevent lung collapse.

Bronchodilator therapy

- There is limited direct evidence evaluating bronchodilators specifically during acute exacerbations of bronchiectasis. However, short-acting beta-agonists (SABAs) such as salbutamol and short-acting muscarinic antagonists (SAMAs) such as ipratropium bromide are frequently used to relieve bronchospasm and dyspnea during exacerbations. (Grade D)
- Bronchodilators (short-acting beta-agonists and/or muscarinic antagonists) should be considered during acute exacerbations of bronchiectasis in patients with co-existing reversible airway obstruction or symptoms suggestive of bronchospasm. (Grade B)

Suggested Regimens

- SABA: Salbutamol 100–200 mcg via MDI with spacer every 4–6 hours as needed
- SAMA: Ipratropium bromide 20–40 mcg via MDI every 6 hours as needed
- Nebulized bronchodilators (SABA /SAMA or both) every 4- 6 hour may be used in moderate-to-severe exacerbations or in patients unable to use inhalers properly

Anti-inflammatory therapy

- Unlike asthma and COPD, the role of anti-inflammatory therapy (particularly corticosteroids) in managing acute exacerbations of bronchiectasis remains limited and poorly supported by direct evidence [10].
- Systemic corticosteroids have not demonstrated consistent benefits in reducing symptoms or improving outcomes in bronchiectasis exacerbations without co-existing obstructive airway disease [26]. (Grade C)

- **However, short course of corticosteroids, (e.g., prednisolone 30–40 mg for 5–7 days) or IV Methyl prednisolone 20 mg twice/thrice daily for 5 days) may be considered in patients with bronchiectasis who also have asthma, allergic bronchopulmonary aspergillosis (ABPA), or COPD and are experiencing an exacerbation with features of wheeze or airway hyperresponsiveness. (Grade C)**

Acute exacerbation due to influenza or COVID-19

- For patients who present with an exacerbation that is caused by viral infection, begin antiviral therapy [9,27]. (Grade B)
- Influenza antiviral therapy is usually indicated for patients whose exacerbation of bronchiectasis has been triggered by influenza virus [9]. (Grade B)
- The usual treatment is oral oseltamivir 75 mg twice daily for 5- 7 days.
- Patients with bronchiectasis exacerbations due to COVID-19 should receive antiviral therapies in either the outpatient or inpatient setting, depending on disease severity [9,28]. (Grade C)
- Specific therapy for COVID-19 should be individualized based on symptoms, risk factors for severe disease, time since symptom onset, and location of care.(Grade C)

Table 3: Common organisms associated with acute exacerbation of bronchiectasis and suggested antimicrobial agents.

Organism	Recommended first line treatment	Recommended second line treatment	Length of treatment
Streptococcus pneumoniae	Amoxicillin 500 mg Three times a day	Doxycycline 100 mg BD	14 days
Haemophilus influenzae	Amoxicillin with clavulanic acid 625 one tablet Three times a day	Cefpodoxime 200 mg BD Doxycycline 100 mg BD	14 days
Moraxella catarrhalis	Amoxicillin with clavulanic acid 625 one tablet Three times a day	Clarithromycin 500 mg BD Or Doxycycline 100 mg BD Or Ciprofloxacin 500 mg or 750 mg BD	14 days
Staphylococcus aureus (MSSA)	Cefpodoxime 200 mg BD Or Flucloxacillin 500 mg Four times a day	Amoxicillin with clavulanic acid 625 one tablet Three times a day	14 days
Staphylococcus aureus (MRSA)	Linezolid 600 mg BD	Vancomycin IV 1 gm BD or 8 hourly (according to blood level)	14 days
Coliforms for example, Klebsiella, Enterobacter	Oral Ciprofloxacin 750 mg BD or Levofloxacin 750 mg OD	Intravenous Ceftriaxone 2G OD	14 days

Pseudomonas aeruginosa	Oral Ciprofloxacin 750 mg BD	**Monotherapy:** Intravenous Ceftazidime 2G TDS Or Piperacillin with tazobactam 4.5G QID Or Meropenem 2G TDS **Combination therapy:** The above can be combined with nebulized gentamicin or tobramycin Or Colistin 2MU TDS daily in 3 divided doses)	14 days

Management of Exacerbation-associated Hemoptysis

- Bleeding due to bronchiectasis is typically associated with acute infective episodes and is produced by injury to superficial mucosal neovascular bronchial arterioles [29].
- Although minor hemoptysis (blood-streaked sputum) is a frequent annoyance during exacerbations, more serious and even life-threatening bleeding may occur [29]

Minimal and self-limited hemoptysis

- For bronchiectasis patients who present with blood in their sputum or self-limited expectoration of small amounts of blood during an exacerbation, obtain a chest radiograph to assess for new cavitary processes or pneumonia complicating the exacerbation [29].
- For those with a stable chest radiograph, treatment of the exacerbation is generally sufficient, with further evaluation only necessary for clinical worsening.
- For bronchiectasis patients with active bleeding, flexible bronchoscopy and chest CT with arterial contrast are complementary diagnostic tools to localize the bleeding to a lobe or segment [29].
- Once the site of bleeding is identified, local bronchoscopic techniques such as balloon tamponade, topical application of a vasoconstrictive or coagulant agent, laser therapy, electrocautery, may be able to greatly decrease or stop the bleeding [9].
- If bronchoscopic techniques to control bleeding are unsuccessful or are not available, the next step is usually arteriographic embolization of bleeding sites (typically from a bronchial artery) by an interventional radiology (IR) service [9].
- If embolization is unsuccessful and bleeding persists, surgical resection may be necessary.

Life-threatening hemoptysis

- In patients with life-threatening hemoptysis, initial measures should focus on securing the airway, maintaining adequate ventilation, ensuring hemodynamic stability, and correcting any bleeding diathesis [9].
- Early bronchoscopy to identify the site of bleeding is very helpful for optimal positioning (placing the bleeding side down) and lung isolation if necessary [9].
- IR-guided techniques may be used subsequently in an attempt to achieve bleeding control.
- Patients may occasionally require urgent surgery for the management of life-threatening hemoptysis due to bronchiectasis that cannot be controlled with less invasive measures [9].

Management of Rapidly Deteriorating Patients

Narrative question # 6: What investigations and treatment options are appropriate for bronchiectasis patients with rapidly worsening symptoms or frequent exacerbations?

Evidence Statements

- Deterioration in bronchiectasis patients represents a major clinical challenge due to its association with significant morbidity and mortality, making prompt management essential.
- Despite extensive review, specific studies addressing rapidly deteriorating bronchiectasis cases remain limited. Previous guidelines did not explicitly define or manage such cases, offering only indirect recommendations for worsening symptoms. Therefore, the evidence and guidance from the ERS 2025 guideline have been adopted [10]

Recommendations

- Patients with worsening symptoms, increased exacerbation frequency/severity, or rapid lung function decline should undergo full clinical review and treatment optimization.
- **Specialist Referral:** Patients not under bronchiectasis specialist care should be referred promptly.
- **Treatment Adherence:** Evaluate adherence to airway clearance techniques and prescribed medications.
- **Underlying Conditions:** Reassess comorbidities to ensure adequate management. Early diagnosis, identification of underlying causes, infection control, and exacerbation prevention may slow disease progression [10].
- **Targeted Investigations:** Consider testing conditions linked to deterioration, such as ABPA, NTM infection, or new pathogens [10].
- **Repeat Imaging and Testing:** Chest CT and sputum testing specially for TB and NTM should be repeated, especially if deterioration persists despite appropriate therapy [10].
- **Optimized Management:** Apply a "treatable traits" approach, including airway clearance, mucoactive therapy, vaccination, long-term macrolides, P. aeruginosa eradication, inhaled therapies, pulmonary rehabilitation, oxygen, and non-invasive ventilation as appropriate [10]
- **Surgical Options:** Lung resection may be considered for localized disease unresponsive to optimized medical therapy [10].
- **Transplant Referral (if available):** Early consideration for lung transplantation is essential in progressive cases despite optimal treatment, particularly with rapidly declining FEV_1 or FEV_1 <30% predicted and/or $PaCO_2$ >50 mmHg [10].

Treatment of Respiratory Failure in Bronchiectasis

Narrative question # 7: Does the use of non-invasive ventilation and long-term oxygen therapy provide clinical benefit for bronchiectasis patients with respiratory failure?

Evidence statements

- A retrospective analysis of patients treated with non-invasive versus invasive ventilation for respiratory failure reported a 32% failure rate with NIV for progression to Invasive

- Ventilation (IV) or death. The overall hospital mortality was around 25%, not different between NIV and IV [30] (3)
- It is reported that the use of NIV in patients with bronchiectasis observed improvement in quality of sleep and in levels of daytime activity. Some patients reported that the improvement in their respiratory status outweighed the discomfort due to NIV [31](3+)
- A retrospective study with severe diffuse bronchiectasis investigating NIV as rescue therapy for nocturnal home use with daytime oxygen found a significant increase in FEV1 12 months after initiation of NIV [32](3+)
- There are no specific studies of LTOT for respiratory failure in bronchiectasis, but expert opinion based on data in COPD is that this is likely to be a beneficial intervention [33,34](4)

Recommendations

- Consider long term oxygen therapy for patients with bronchiectasis and respiratory failure, using the same eligibility criteria as for COPD (PaO2<55mmhg OR So2<88%). (Grade D)
- Consider domiciliary non-invasive ventilation for patients with bronchiectasis and respiratory failure associated with hypercapnia, especially where this is associated with symptoms or recurrent hospitalization. (Grade D)
- Acute respiratory failure is secondary to acute exacerbation of bronchiectasis is treated as per clinical indications with supplemental oxygen with nasal oxygen cannula, face oxygen mask, non-rebreather oxygen mask, non-invasive ventilation and invasive ventilation. (Grade C)

Surgical Management of Bronchiectasis

Narrative question # 8: What are the clinical indications for lung resection surgery (lobectomy or segmentectomy), in patients with bronchiectasis?

Evidence statements

- Despite extensive search, specific clinical trials to address lung resection surgery in patients with bronchiectasis are lacking from Pakistan or LMICs. Recommendations in various guidelines are primarily based on expert consensus and established clinical practice rather than high-quality trials, resulting in low overall certainty of evidence

The indications in guidelines for surgical resection in localized bronchiectasis include: [9,10,34]

- Persistent symptoms despite comprehensive medical treatment for up to one year
- Exacerbations that are either severe or frequent and interfere with social/professional life
- Recurrent refractory or massive hemoptysis
- Localized severely damaged lobe/segment that may be a source of sepsis that if left in situ may lead to extension of lung damage
- Different surgical approaches may be considered like VATS and open lung surgery. The VATS is better tolerated as compared to open lung surgery as it is associated with fewer postoperative complications [35]
- Freedom from symptoms of bronchiectasis have reported as high as 61%–84%when followed up from between 1 to 5 years or more post-operatively [36,37].
- Video assisted thoracoscopic technique can provide outcomes at least as successful as open surgery [38]

Recommendations

- Consider lung resection in patients with localized disease whose symptoms are not controlled by medical treatment optimized by a bronchiectasis specialist. (Grade D)
- Offer multidisciplinary assessment, including a bronchiectasis physician, a thoracic surgeon and an experienced anesthetist, for the suitability for surgery and pre-operative assessment of cardiopulmonary reserve post resection. (Grade C)
- Consider nutritional support and pre-operative pulmonary rehabilitation before surgical referral. (Grade D)

Narrative question # 9: What is the role of lung transplant in the management of bronchiectasis, and in which patients should it be considered?

Evidence statements

- Despite extensive search, specific clinical trials to address lung transplant in patients with bronchiectasis are lacking from Pakistan. Recommendations in various guidelines are primarily based on expert consensus and established clinical practice rather than high-quality trials, resulting in low overall certainty of evidence [9,10, 34].
- Lung transplantation for end stage bronchiectasis is a useful therapeutic option with good survival and lung functions outcome. Survival rate is not different to other lung transplantation surgeries [39].(2-)
- Lung transplantation is generally planned when maximal medical therapy is failed and there is diffuse involvement of the lung parenchyma [40].(3-)
- A retrospective review of case notes and transplant database reviewed survival rate of 74% at 1 year,64% at 3 years ,61% at 5 years and 48 % at 10 years [39]. (3-)
- As stated in international Lung transplantation guidelines, post-transplant morbidity and mortality increase with age and hence transplantation is in general reserved for those aged 65 years or less [41].(3-)
- In selected patients with bronchiectasis, lung transplantation improves quality of life and is associated with post-transplant survival of over 60% at 5 years [9].(3)

Recommendations

- Consider transplant referral in bronchiectasis patients aged 65 years or less, if the FEV1 is less than 30% with significant clinical instability or if there is a rapid progressive respiratory deterioration despite optimal medical management. (Grade C)
- Consider earlier transplant referral in bronchiectasis patients with poor lung function and the following additional factors: massive hemoptysis, severe secondary pulmonary hypertension, ICU admissions or respiratory failure (particularly if requiring NIV). (Grade D)

As transplant facility is not available in Pakistan, discuss appropriate patients with a transplant center prior to formal referral.

Treatment of Treatable Traits in Bronchiectasis

The management of bronchiectasis in Pakistan requires a tailored approach that emphasizes the identification and treatment of underlying and modifiable risk factors, commonly referred to as "treatable traits." [42]. These traits, including post-infectious causes such as tuberculosis, immunodeficiency, chronic airway diseases like asthma and

COPD etc. are highly prevalent in the local population due to endemic infections, limited healthcare access, and socioeconomic challenges. Addressing these treatable traits is essential to reducing disease burden, improving quality of life, and minimizing exacerbations and hospitalizations. A structured and individualized management plan targeting these specific etiologies can significantly enhance outcomes in patients with bronchiectasis in Pakistan. (Table 4)

Table 4: Treatable traits of bronchiectasis and their management strategies

Etiological Factor / Treatable Trait	Key Characteristics	Management Strategies
Post-Infectious	History of severe or recurrent lower respiratory tract infections	Prolonged antibiotic therapy, airway clearance techniques, vaccination, and treatment of underlying infections
Congenital (e.g., Cystic Fibrosis, Primary Ciliary Dyskinesia)	Genetic conditions affecting mucociliary clearance	CFTR modulators, airway clearance, inhaled bronchodilators, mucolytics, sinus surgery, and multidisciplinary care
Immunodeficiency (Primary or Secondary)	Recurrent infections, poor vaccine response, low immunoglobulin levels	Immunoglobulin replacement therapy, prophylactic antibiotics, and treatment of secondary causes like hematologic malignancy or medication-induced immunosuppression
Allergic Bronchopulmonary Aspergillosis (ABPA)	Asthma, central bronchiectasis, raised total IgE, positive Aspergillus-specific IgE/IgG	Systemic corticosteroids, antifungals (e.g., itraconazole), (as per ISHAM guideline, management of underlying asthma, and airway clearance
Autoimmune Disease-associated	Coexisting autoimmune disease (e.g., rheumatoid arthritis, IBD, Sjögren's syndrome)	Airway clearance, immunosuppressants in collaboration with rheumatology/gastroenterology, and management of systemic disease

Asthma (Coexistent)	Reversible airflow obstruction, eosinophilia, elevated FeNO	Inhaled corticosteroids, bronchodilators (LABA), leukotriene receptor antagonists, and management of exacerbating triggers (as per GINA guideline
Chronic Obstructive Pulmonary Disease (COPD)	Chronic airflow limitation, smoking or biomass fuel exposure history	Smoking cessation, inhaled bronchodilators and corticosteroids (especially when blood eosinophil counts are raised), pulmonary rehabilitation, vaccination, and oxygen if hypoxic. (follow GOLD guidelines)
Gastroesophageal Reflux Disease (GERD)	Chronic cough, heartburn, regurgitation, risk of aspiration	Lifestyle modification, proton pump inhibitors, and GI referral
Nontuberculous Mycobacterial (NTM) Infection	Nodular or cavitary disease on HRCT, culture positive for NTM (use ATS diagnostic criteria)	Long-term antibiotic regimens (follow BTS guideline for NTM management), airway clearance, and infectious disease consultation if needed
Obesity /OSA/OHS	Contributes to reduced lung volumes, increased dyspnea. On PSG OSA / OHS	Weight reduction through lifestyle intervention, pulmonary rehabilitation, CPAP therapy if OSA or OHS are present. Airway clearance. In refractory cases multidisciplinary management.

Prognosis of Bronchiectasis in Pakistan

Bronchiectasis prognosis varies widely and depends on factors such as underlying cause, lung function, exacerbation frequency, and chronic infections, especially Pseudomonas aeruginosa.

In Pakistan, outcomes may be poorer due to delayed diagnosis, high rates of post-tuberculosis bronchiectasis, limited specialist care, and antimicrobial resistance. A local study reported post-TB bronchiectasis as the leading cause (52.9%) and P. aeruginosa as the most common pathogen (38.8%), both linked to frequent exacerbations and extensive bilateral disease, increasing mortality risk [2,3].

Key prognostic factors include:

- Frequent exacerbations
- Chronic colonization with Pseudomonas aeruginosa
- Decline in FEV_1 or poor baseline lung function
- Higher Bronchiectasis Severity Index (BSI) or FACED score
- Co-existing COPD, ABPA, asthma, or cardiovascular disease
- Hemoptysis and hypoxemic respiratory failure

In South Asia, post-infectious bronchiectasis often causes severe lung damage and complications, requiring close monitoring. Reported 5-year mortality ranges from 10–30%, with lower survival expected in resource-limited settings lacking structured follow-up and guideline-based care.[43].

Future Research Directive for Bronchiectasis in Pakistan

To strengthen the evidence base and improve clinical outcomes for non-cystic fibrosis (non-CF) bronchiectasis in Pakistan, the following research priorities are recommended

1. National Bronchiectasis Registry

- Establish a centralized registry to collect comprehensive data on demographics, etiology, microbiology, radiology, and treatment outcomes.

2. Etiological Studies with Focus on Post-Tuberculosis Bronchiectasis

- Conduct multicenter research to quantify and characterize post-TB bronchiectasis, the most prevalent form in Pakistan.

3. Microbiological Surveillance and Resistance Patterns

- Investigate the prevalence and antibiotic resistance of key pathogens, especially Pseudomonas aeruginosa, to guide empirical therapy.

4. Treatable Traits and Personalized Management

- Explore phenotype-based treatment strategies, including airway clearance, long-term macrolide therapy, and inhaled antibiotics, tailored to local healthcare settings

5. Socioeconomic and Environmental Impact

- Study the influence of poverty, air pollution, and healthcare access on disease progression and treatment efficacy.

6. Pulmonary Rehabilitation and Quality of Life

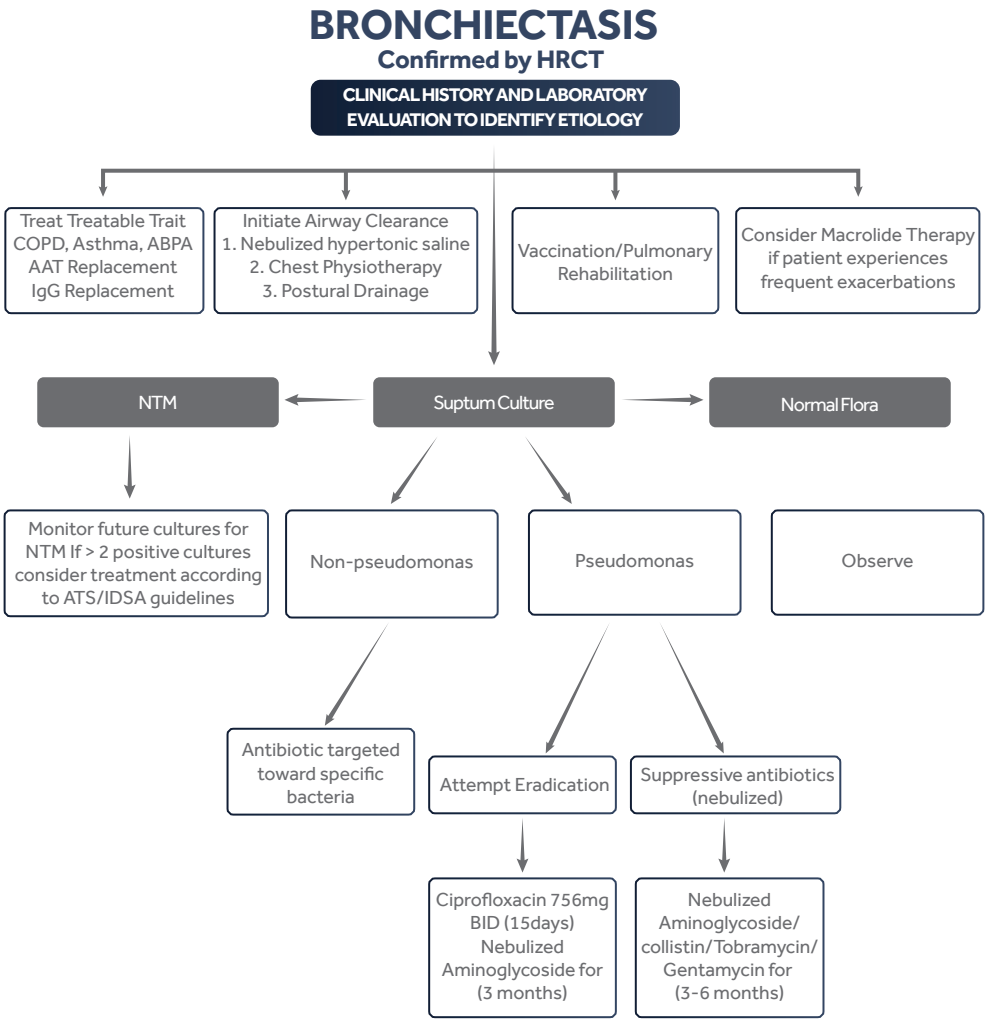
- Assess the impact of structured rehabilitation programs on exercise capacity, symptom control, and patient-reported outcomes.

7. Development of Local Clinical Pathways

- Create and validate diagnostic and management algorithms suitable for primary and secondary care settings in Pakistan.

These research directives aim to promote evidence-based, context-specific care and inform future updates to national guidelines for bronchiectasis management.

Figure 8
Algorithm: Management of bronchiectasis in adults



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