The Deteriorating Patient

- Significant and prolonged deterioration of symptoms
- Unexpected increased frequency or severity of exacerbations
- Frequent hospital admissions
- Early relapse after treatment of an exacerbation
- Rapid decline in lung function

ASSESSMENT

1. Ensure patient understanding

2. Assess disease progression
   - Oxygen saturations room air and ABGs if appropriate
   - Spirometry and consider lung volume and gas transfer measurement
   - CT Chest (contrast if PE suspected)

3. Reassess pathogens
   - Sputum C+S (routine bacteriology and fungal culture)
   - 3 sputum samples for Mycobacterial Culture
   - If no sputum, consider induced sputum or BAL

4. Aetiology Consider
   - FBC, IgE, IgE to aspergillus, Aspergillus IgG for new development of ABPA
   - IgG, IgA and IgM and functional antibodies to check no requirement for Ig replacement therapy
   - Check specific aetiologies have been excluded, in particular CF, ABPA, GERD, CVID and Inflammatory Bowel Disease

5. Consider comorbidities
   - Echocardiogram to assess LV function and for Pulmonary Hypertension
   - Assess if have sinus disease and whether treated
   - Exclude PE if suspected

OPTIMISATION

1. Airways clearance
   - Check compliance
   - To see respiratory physiotherapist to check on optimum regimen +/- pulmonary rehabilitation
   - Consider muco-active treatment

2. Exacerbations
   - Check patients are receiving prompt and appropriate antibiotics
   - Check receiving correct antibiotic duration
   - Check not meeting the requirements for intravenous antibiotic therapy

3. Oxygen
   - Give LTOT if meets criteria

FURTHER MANAGEMENT

- Treat identified cause if found
- Treat underlying aetiology
- Consider intravenous antibiotic course
- Consider long term antibiotic (see management algorithm)
- Consider if needed
  - LTOT +/- NIV
  - Surgery
  - Transplantation
  - End of Life Support

Abbreviations:
ABGs: Arterial Blood Gases
CT: Computed Tomography
PE: Pulmonary Embolism
BAL: Bronchoalveolar lavage
FBC: Full Blood Count
IgE: Immunoglobulin E
IgG: Immunoglobulin G
ABPA: Allergic bronchopulmonary aspergillosis
IgM: Immunoglobulin M
Ig: Immunoglobulin
CF: Cystic Fibrosis
GERD: Gastroesophageal reflux disease
CVID: Commune variable immune deficiency
LV: Left ventricle
LTOT: Long Term Oxygen Therapy
NIV: Non-invasive ventilation
Step 1
- Treat underlying cause
- Airways clearance techniques +/- pulmonary rehabilitation
- Annual influenza vaccination
- Prompt antibiotic treatment for exacerbations
- Self management plan

Step 2
If 3 or more exacerbations/yr despite Step 1*
- Physiotherapy reassessment and consider mucoc-active treatment

Step 3
If 3 or more exacerbations/yr despite Step 2*
1] If *Pseudomonas aeruginosa*, long term inhaled anti-pseudomonal antibiotic or alternatively long term macrolide
2] If Other Potential Pathogenic Bacteria, long term macrolides or alternatively long term macrolides or alternatively long term oral or inhaled targeted antibiotic
3] If no pathogen, long term macrolides

Step 4
If 3 or more exacerbations/yr despite Step 3*
- Long term macrolide and long term inhaled antibiotic

Step 2
If 5 or more exacerbations/yr despite Step 4*
- Consider regular intravenous antibiotics every 2-3 months

*Consider this step if significant symptoms persist despite previous step, even if not meeting exacerbation criteria

Figure 2 Stepwise management
Antibiotics are used to treat exacerbations that present with an acute deterioration (usually over several days) with worsening local symptoms (cough, increased sputum volume or change of viscosity, increased sputum purulence with or without increasing wheeze, breathlessness, haemoptysis) and/or systemic upset. The flow diagram refers to three or more annual exacerbations.
**STEP 1**
Offer active cycle of breathing techniques (ACBT) to individuals with bronchiectasis.
Consider gravity assisted positioning (where not contraindicated) to enhance the effectiveness of an airway clearance technique. If contraindicated then modified postural drainage should be used.

Patients should be reviewed within 3 months.
This should include evaluation of patient reported effectiveness (ease of clearance/patient adherence).
The inclusion of gravity assisted positioning should be for its additional effectiveness.

**STEP 2**
If ACBT is not effective or the patients demonstrates poor adherence, oscillating Positive Expiratory Pressures + Forced Expiration Technique should be considered.

**STEP 3**
If airway clearance is not effective then nebulised Isotonic or Hypertonic Saline should be evaluated for its effectiveness pre-airway clearance (especially in patients with viscous secretions or there is evidence of sputum plugging).

Individuals should be advised to complete Airway Clearance in the following order, if prescribed:
- Bronchodilator
- Mucolytic
- Airway Clearance
- Nebulised antibiotic and/or inhaled steroids (if applicable)

Figure 3 Stepwise airway clearance

ACBT: Active cycle breathing techniques
**Figure 4 Airway clearance – exacerbations**

1. **STEP 1**
   - Increase airway clearance frequency.
   - E.g.: from twice daily to three/four times daily.

2. **STEP 2**
   - Commence the use of mPD or PD if tolerated.
   - For individuals with radiological changes, PD or mPD should be targeted appropriately.

3. **STEP 3**
   - Individuals with ongoing difficulty with airway clearance may benefit from the addition of other techniques. It is recommended that these should be commenced and evaluated in the following order (unless contraindicated):
     1. Enhanced humidification / hydration of airways if secretions viscous (isotonic or hypertonic saline/humidification/ increased fluid intake)
     2. Manual Techniques
     3. Positive pressure devices including Intermittent Positive Pressure Breathing (IPPB) or Non Invasive Ventilation (NIV) to be used during Airway Clearance

PD=postural drainage; mPD= modified postural drainage
Figure 5 Algorithm for initial assessment and treatment - rhinosinusitis