

## Continuing Professional Development - Airway diseases

### Module 1. Syndrome-based approach to diagnosis and differential diagnosis

1. Acute onset
  - 1.1. Acute upper respiratory tract infection (rhinitis, sinusitis, pharyngitis, epiglottitis and laryngotracheitis)
  - 1.2. Influenza
  - 1.3. Acute community-acquired lower respiratory tract infection (bronchitis, bronchiolitis, community-acquired pneumonia and nursing home-acquired pneumonia)
  - 1.4. Acute exacerbation of chronic airway disease (COPD, asthma and bronchiectasis)
2. Non-acute onset
  - 2.1. Persistent rhinitis/rhinosinusitis
  - 2.2. Obstructive lung disease (asthma, COPD and bronchiectasis)
  - 2.3. Chronic cough

### Module 2. Bronchoscopy for airway diseases

1. Biopsy and bronchoalveolar lavage: brushing samples and transbronchial biopsy
  - 1.1. Indications and contraindications for bronchoscopy
  - 1.2. Indications, contraindications, limitations and risks of diagnostic bronchoscopy and lavage
  - 1.3. Principles of patient preparation for bronchoscopy and evaluation prior to each procedure
  - 1.4. Principles of sedation
  - 1.5. Anatomy of the airways
  - 1.6. Description of bronchoscopy technique
  - 1.7. Select appropriate patients for each procedure
  - 1.8. Interpret results
  - 1.9. Support post-procedure care
  - 1.10. Manage anticoagulation therapy before and after the procedure
  - 1.11. Communicate effectively with the patient and family regarding the risks, benefits and results of the procedure

### Module 3. Chest X-ray

1. Basic interpretation of a chest radiograph
  - 1.1. Radiological correlates of chest organs and bony chest structures
  - 1.2. Description of radiological findings of a chest radiograph
  - 1.3. Recognition of abnormal results and formulation of a diagnosis
2. Bullae, pneumothorax, consolidation and hyperinflation
3. Positioning of central venous lines, an endotracheal tube and a nasogastric tube

### Module 4. Computed tomography (CT) scan

1. Features of airway disease, emphysema and COPD
2. Features of bronchiectasis

### Module 5. Assessment of airway inflammation

1. Reversibility testing
2. Bronchial hyper-responsiveness
3. Exhaled nitric oxide (NO)
4. Blood eosinophils
5. IgE
6. Sputum (see Module 6)
7. Interpretation of results
8. Importance of how testing assists diagnosis and monitoring of the treatment response in patients with asthma
9. NO in the context of blood eosinophilia in asthma
10. Limitations of NO testing in COPD

**Module 6. Sputum assessment and basic microbiological methods**

1. Interpretation of induced sputum results (quality and differential cell count)
2. Role in the management of asthma and other diseases (COPD, eosinophilic bronchitis and chronic cough)
3. Culture, PCR results and ELISAs
4. Airway microbiome

**Module 7. Pulmonary function testing**

1. Spirometry and flow-volume loop
2. Body plethysmography
3. Gas exchange (diffusing capacity of the lungs for carbon monoxide (DLco))
4. Arterial blood gas and acid-base status assessment
5. Interpretation of lung function tests
6. The 6-minute walking test
7. Impulse oscillometry
8. Multiple breath nitrogen washout

**Module 8. Inhaled drug therapy**

1. Available devices
2. Differences between devices
3. Use of the devices and how to teach patients
4. Inhaler technique: errors in the use of inhalator devices
5. Inhaled bronchodilators
6. Inhaled corticosteroids
7. Combination therapy (double and triple)

**Module 9. Systemic pharmacotherapy**

1. Corticosteroids in acute exacerbations and the emergency department
2. Phosphodiesterase inhibitors (theophylline and roflumilast)
3. Leukotriene receptor antagonists
4. Biological therapy for asthma
5. Macrolides (anti-inflammatory)
6. Antibiotic treatment in patients with exacerbations
7. Augmentation therapy for  $\alpha$ 1-antitrypsin deficiency
8. Oxygen therapy

**Module 10. Respiratory physiotherapy**

1. Dysfunctional breathing (hyperventilation syndromes)
2. Pulmonary rehabilitation
3. Airway clearance techniques and sputum induction
4. Respiratory muscle training (*e.g.* singing for breathing and yoga)
5. Airway assist devices

**Module 11. Pulmonary rehabilitation**

1. Basic principles of rehabilitation programmes
2. Role of exercise training programmes in COPD
3. Identification of COPD patients who may benefit from rehabilitation programmes
4. Assess physical de-conditioning, symptoms of depression and poor quality of life
5. Exercise training, nutritional and psychosocial counselling, behavioural change, occupational therapy and progressive relaxation techniques in selected patients with lung cancer
6. Participate in a multidisciplinary team (MDT) with other specialists in the specific field
7. Patient/family communication - advantages of participating in rehabilitation programmes

**Module 12. Palliative care**

1. End-of-life relief for patients with dyspnoea by:
  - 1.1. Drug administration

- 1.2. Non-invasive ventilation (NIV)
2. Pain relief
3. End-of-life decision making with patients and their relatives
4. Early integration of palliative care, multidisciplinary care and communication

### **Module 13. Oxygen therapy**

1. Oxygen transport and utilisation
  - 1.1. Mechanisms involved in oxygen transport and tissue oxygenation
  - 1.2. Clinical conditions that compromise oxygen transport and utilisation
  - 1.3. Diagnostic and therapeutic strategies aimed at improving oxygen transport and utilisation
  - 1.4. Recognition of clinical oxygen delivery (*i.e.* cardiac output  $\times$  arterial oxygen content)
  - 1.5. Early recognition and treatment of generalised or local hypoxia/hypoxaemia
  - 1.6. Differentiation between oxygen saturation (SaO<sub>2</sub>) and partial pressure of oxygen (pO<sub>2</sub>) in blood gas analysis (BGA)
2. Modes and principles of oxygen supplementation
  - 2.1. Oxygen uptake and delivery
  - 2.2. Oxygen toxicity
  - 2.3. Indications and contraindications for oxygen therapy
  - 2.4. Gas pressure and liquid oxygen systems/oxygen concentrators
  - 2.5. Principles of oxygen supplementation in acute conditions
    - 2.5.1. Interfaces (including NIV/mechanical ventilation (MV))
    - 2.5.2. Oxygen saturation targets according to the underlying pathology
    - 2.5.3. Monitoring of patients with acute oxygen supplementation
  - 2.6. Criteria for long-term oxygen therapy (LTOT) in patients with COPD and other chronic respiratory diseases
  - 2.7. Monitoring of patients receiving LTOT
3. In-flight oxygen therapy

### **Module 14. Preventative measures**

1. Weight reduction
2. Exercise
3. Influenza vaccination
4. Pneumococcal vaccination
5. Vaccination
6. Smoking cessation
7. Allergen avoidance
8. Specific preventative management in each disease (asthma, COPD and others)

### **Module 15. Smoking prevention and cessation**

1. Smoking cessation
  - 1.1. Effects of smoking on the health of the individual in relation to lung and other diseases  
Beneficial effects of smoking cessation for preventing lung and other diseases
  - 1.2. Smoking cessation therapy (pharmacological and non-pharmacological) in groups and individuals
2. Tobacco risk factors and epidemiology
  - 1.1. Current epidemiology of active and passive smoking worldwide and nationally
  - 1.2. Pathogenic mechanisms of lung cancer associated with tobacco
  - 1.3. Nicotine addiction and withdrawal symptoms
  - 1.4. Plan smoking cessation for an individual patient
  - 1.5. Refer patients to a tobacco cessation specialist
  - 1.6. Communicate the effects of tobacco consumption to patients and their families in a clear and understandable manner
  - 1.7. Encourage and support individuals to quit smoking

1.8. Discourage passive smoking

**Module 16. Non-invasive and invasive ventilation**

1. Modes and principles of non-invasive MV
  - 1.1. Indications for NIV in patients with acute COPD exacerbation, chronic respiratory failure in COPD and acute severe asthma
    - 1.1. Appropriate time and location (ward, intensive care unit (ICU), *etc.*) to start NIV
    - 1.2. Risks and benefits of NIV to the patient
    - 1.3. Identify situations where NIV is contraindicated or expected to be unsuccessful
    - 1.4. Alternative treatment modalities
    - 1.5. Communicate the limitations of NIV to the patient
2. Side effects and complications of NIV
  - 2.1. Select appropriate medications to support NIV tolerance without compromising the respiratory status of the patient
3. Continuous positive airway pressure (CPAP)
  - 3.1. Functional principle of CPAP
  - 3.2. Role and function of CPAP in hypoxemic respiratory failure due to other causes
  - 3.3. Select the correct CPAP/expiratory positive airway pressure settings to treat functional upper airway collapse and hypoxaemia/hypercapnia when indicated
  - 3.4. Choice and application of the appropriate interface
  - 3.5. Monitor results following a change in settings
  - 3.6. Willingness to explain CPAP to the patient and to illustrate which responses can potentially be achieved with this treatment
4. Withdrawal of NIV
  - 4.1. If, when and how NIV can be withdrawn after successful treatment
  - 4.2. Monitoring/follow-up process in these patients
  - 4.3. Rationale to switch patients to chronic/continuous NIV
  - 4.4. Circumstances that permit step-down to CPAP or oxygen therapy
  - 4.5. Plan to guide withdrawal from NIV
  - 4.6. Follow-up plan to promptly detect relapses requiring NIV
  - 4.7. Patient communication (discuss the patient approach and instruct him/her how follow-up should occur)

**Module 17. Pneumothorax**

1. Chest tube insertion, maintenance of the tube and drainage systems and insertion of a decompression needle for tension pneumothorax
2. Indications, contraindications and risks of chest tube insertion and needle decompression
  - 2.1. Anatomic sites for tube placement or needle insertion
  - 2.2. Different thoracentesis systems (open preparation *versus* trocar tubes)
  - 2.3. Drainage and suction systems
3. Perform chest tube insertion and needle decompression
4. Manage complications as appropriate with support from different specialties
5. Discuss the risk, benefits and results of the procedures with the patient and/or his/her family

**Module 18. Lung transplantation - indications and preoperative/postoperative care**

1. Indications for lung transplantation, *e.g.* COPD according to severity of illness and bronchiolitis
2. Principles of evaluation for lung transplantation
3. Severity grading of lung diseases with respect to referring a patient to a transplant centre
4. Monitoring and treatment of patients with severe respiratory insufficiency before lung transplantation

### **Module 19. Respiratory emergencies**

1. Evaluation, differential diagnosis, immediate management steps, first-line treatment and specific conditions
2. Diagnosis and first-line treatment of:
  - 2.1. Severe/life-threatening exacerbation of asthma
  - 2.2. Severe exacerbation of COPD
  - 2.3. Tension pneumothorax

### **Module 20. Upper airway diseases**

1. Acute upper respiratory tract infection
  - 1.1. Rhinitis/rhinosinusitis
  - 1.2. Pharyngitis
  - 1.3. Epiglottitis
  - 1.4. Laryngitis/laryngotracheitis
2. Persistent rhinitis/rhinosinusitis
  - 2.1. Allergic
  - 2.2. Non-allergic
  - 2.3. Association with lung disease (asthma, cystic fibrosis (CF), ciliary diseases, granulomatosis with polyangiitis and others)
3. Vocal cord dysfunction and paralysis
4. Laryngeal cancer: topics relevant to respiratory physicians (association with smoking/lung cancer and tracheostomy)

### **Module 21. Asthma**

1. Epidemiology of asthma (prevalence, mortality, morbidity, burden on society, etc.)
2. Differential diagnosis (DD) Allergic bronchopulmonary aspergillosis
3. DD Differentiation from eosinophilic granulomatosis with polyangiitis (Churg-Strauss syndrome)
4. Risk factors in asthma:
  - 4.1. Genetics of asthma
  - 4.2. Atopy and bronchial hyper-responsiveness (BHR))
  - 4.3. Environmental risk factors
5. Mechanisms in asthma / immunology of asthma
6. Early life risk and protective factors and underlying mechanisms
7. Pathology of asthma
8. Diagnosis of asthma
9. Pheno/endotypes of asthma
10. Evaluation of asthmatic patients
  - 10.1. Allergy testing (in vivo and in vitro)
  - 10.2. Airway inflammation (NO, sputum and exhaled breath)
11. Monitoring of asthmatic patients
  - 11.1. Asthma control
  - 11.2. Instruments
12. Non-pharmacological treatment
  - 12.1. Allergen immunotherapy
  - 12.2. Avoidance of allergens/other
  - 12.3. Breathing techniques
  - 12.4. Psychological support
13. Pharmacological treatment
  - 13.1. Principles of inhalation therapy (see above)

- 13.2. Asthma medication (see above)
  - 13.3. Principles of asthma treatment (step treatment, change of step, etc.)
  - 14. Patient education
    - 14.1. Disease
    - 14.2. Treatment
    - 14.3. Self-management (written plan)
  - 15. Exacerbation of asthma
    - 15.1. Risk of death from asthma
    - 15.2. Evaluation: severity assessment
    - 15.3. Management
  - 16. Asthma-COPD overlap
- Severe asthma**
- 17. Definition of difficult-to-treat asthma
  - 18. Evaluation of difficult-to-treat asthma
- Status asthmaticus - pathophysiology of asthma**
- 19. Principles of recognition of status asthmaticus
  - 20. Indication for oxygen therapy, NIV and intubation
  - 21. Pharmacology and side effects of anti-asthmatic drugs
  - 22. Principles of delivery of and response to aerosol therapy
  - 23. Possible complications of status asthmaticus (e.g. pneumothorax and pneumomediastinum) and their management
  - 24. Indications for non-pharmacological treatment (e.g. oxygen therapy and MV)
  - 25. Providing outpatient and inpatient care as well as emergency and ICU treatment
  - 26. Translation of national and international management recommendations for status asthmaticus to individualised management
  - 27. Recognition and management of patients at risk of life-threatening asthma requiring intubation
  - 28. MV of status asthmaticus patients
  - 29. Willingness to translate guidelines to a customised approach for an individual patient
  - 30. Up-to-date knowledge of emergency therapeutic strategies
    - 30.1. Gastroesophageal reflux and asthma
    - 30.2. Work-related asthma

**Module 22. COPD**

- 1. Epidemiology of COPD (prevalence, mortality, morbidity, burden on society, etc.)
- 2. Risk factors:
  - 2.1. Smoking
  - 2.2. Environmental risk factors
  - 2.3. Genetic risk factors
  - 2.4.  $\alpha$ 1-antitrypsin deficiency
- 3. Pathology and physiopathology of COPD
- 4. Mechanisms of COPD / immunology of COPD
- 5. Early life risk and protective factors and underlying mechanisms
- 6. COPD diagnosis (clinical suspicion and spirometry)
- 7. Evaluation of COPD patients
  - 7.1. Pulmonary component
  - 7.2. Extrapulmonary effects (comorbidities)
- 8. Exercise testing in COPD

9. Pharmacological management
  - 9.1. Bronchodilators
  - 9.2. Other drugs
10. Non-pharmacological management
  - 10.1. Oxygen therapy
  - 10.2. Pulmonary rehabilitation
  - 10.3. Smoking cessation
  - 10.4. Long-term NIV
  - 10.5. Vaccinations
11. Exacerbation of COPD
  - 11.1. Severity assessment
  - 11.2. Drug treatment
  - 11.3. Oxygen therapy
  - 11.4. NIV
  - 11.5. Invasive ventilation
12. Depression and anxiety in COPD

**Module 23. Bronchiolitis**

1. Subtypes of bronchiolitis
2. Diagnosis and treatment
3. Macleod syndrome
4. Causes of bronchiolitis obliterans

**Module 24. Bronchiectasis**

1. Causes
2. Mechanism underlying the development of bronchiectasis
3. Diagnosis of bronchiectasis
  - 3.1. CT
4. Microbiological assessment
5. Aetiological diagnosis
6. Exacerbation
7. Management
  - 7.1. Antibiotics (systemic and inhaled)
  - 7.2. Physiotherapy/pulmonary rehabilitation
  - 7.3. Vaccinations
  - 7.4. Oral/inhaled mucolytics
  - 7.5. Other

**Module 25. Sepsis syndrome (definition, diagnosis & treatment)**

1. Diagnostic criteria of severe sepsis and septic shock including the causative disease and laboratory and other tests necessary to assess severity
2. Clinical implications and therapeutic support measures for these conditions
3. Detection of patients that potentially have these conditions and the causative disease
4. Choosing the most appropriate tests to assess severity and to implement therapeutic support measures
5. Willingness to respond immediately and to identify appropriate diagnostic and therapeutic measures
6. Systemic inflammatory response syndrome (SIRS)
  - 6.1. Diagnostic criteria of SIRS, the causative disease, clinical implications and treatment of this condition
  - 6.2. Detection of patients with SIRS and the causative disease

- 6.3. Implementation of therapy  
6.4. Willingness to differentiate SIRS from sepsis

**Module 26. Infections in an immunocompromised host**

1. Hospital-acquired and opportunistic infections in critically ill patients in the ICU
2. Predisposing factors including immunosuppression
3. Diagnostic criteria
4. Most frequent etiologic pathogens and recommended empiric treatment for each infection
5. Detection and diagnosis of these patients
6. Implementation of appropriate diagnostic methods
7. Appropriate selection of empiric treatment
8. Willingness to detect hospital-acquired and opportunistic infections in critically ill patients and to implement diagnostic tests and therapy

**Module 27. Pulmonary TB and Non-tuberculous mycobacterial diseases**

1. Pathology, biology and immunology
2. Anti-TB agents
  - 3.1. Different anti-TB agents and their spectrum of activities in different mycobacterial infections
  - 3.2. Prescribing anti-TB agents in first-line combinations
  - 3.3. Recognition of the adverse effects of anti-TB agents
  - 3.4. MDR- and XDR-TB

**Module 28. Lung cancer (including paraneoplastic syndromes)**

1. Epidemiology of lung cancer
2. Aetiology and risk factors of lung cancer
3. Personalised treatment of lung cancer (radiotherapy, (personalised/targeted) chemotherapy, immunotherapy and their interactions)
4. Side effects of lung cancer treatment
5. Staging
6. Management options
7. Preoperative evaluation for lung resection
8. Paraneoplastic syndrome
9. Identification of immunotherapy and diffuse metastasis as causes of respiratory failure

**Module 29. Obstructive sleep apnoea (OSA) and syndrome (OSAS)**

1. Sleep-disordered breathing (SDB)
  - 1.1. Physiology and pathophysiology of sleep apnoea syndromes relevant to ARF
  - 1.2. Diagnosis and screening of OSA, upper airway obstruction and hypoventilation
  - 1.3. Interpretation of blood gases and other tests for SDB
  - 1.4. Recognition of obesity as a cause of weaning failure in obese patients
2. OSAS
  - 2.1. Definitions of SDB (OSA, OSAS, central sleep apnoea (CSA), CSA syndrome (CSAS), Cheyne-Stokes respiration (CSR), obesity hypoventilation syndrome (OHS), upper airway resistance syndrome (UARS) and snoring)
  - 2.2. Define SDB and discuss the definitions (*e.g.* OSA, OSAS, CSA, CSAS, CSR, OHS, UARS and snoring)
3. OSA
  - 3.1. Diagnostic evaluation of patients presenting with SDB
4. Clinical aspects of OSA
  - 4.1. Describe the characteristics of subjective impairment and signs
  - 4.2. Describe the characteristics of the mouth, throat and craniofacial configuration
  - 4.3. List the cardiovascular signs
  - 4.4. Produce a sleep history

- 4.5. Clinical examination of the mouth and throat
- 5. Comorbidities of OSA
  - 5.1. Summarise cardiovascular disease
  - 5.2. List the metabolic consequences
- 6. Treatment and follow-up
  - 6.1. Treatment of respiratory sleep disorders
  - 6.2. OSA
  - 6.3. Treatment pathways including:
    - 6.3.1. Review of treatment modalities
    - 6.3.2. CPAP

### **Module 30. Hypoventilation syndromes**

- 1. Central hypoventilation syndrome
  - 1.1. Evaluate and diagnose daytime hypercapnia by control of blood gases, transcutaneous capnography and body weight/clinical muscle assessment
  - 1.2. Interpret blood gases
  - 1.3. Assess indications for NIV; application or supervision of a mask and interface
  - 1.4. Explain the illness and risk of obesity and offer advice about how to decrease body mass index (BMI) through physical activity, training and diet
  - 1.5. Teach the patient how to use a NIV device
- 2. Obesity hypoventilation syndrome
  - 2.1. Recognise the symptoms and clinical presentation
  - 2.2. Understand the pathophysiology of obesity hypoventilation syndrome
  - 2.3. Explain the consequences (polyglobulia and cor pulmonale)
  - 2.4. Define hypercapnic respiratory failure
  - 2.5. Explain OSA
- 3. Treatment
  - 3.1. Treatment pathways
  - 3.2. Compare different methods of NIV and additional indications for oxygen supply
  - 3.3. Select treatment methods including changing inappropriate lifestyles and reducing body weight
  - 3.4. Recognise the advantages and disadvantages of different treatment options according to the patient's tolerance
- 4. NIV
  - 4.1. Explain different NIV methods applied using various interfaces
  - 4.2. Review indications for CPAP, bilevel pressure, adaptive servo ventilation and pressure support
  - 4.3. Classify ventilatory modes (spontaneous S, time T and ST)
  - 4.4. Apply treatment modalities and set and adjust the device properly
- 5. Follow-up and compliance
  - 5.1. Explain objective and subjective compliance
  - 5.2. Discuss side effects
  - 5.3. Estimate tolerance
  - 5.4. Evaluate the efficiency of the selected treatment method and NIV method (mask comfort *etc.*) based on patient interviews and polysomnography

### **Module 31. Acute and chronic respiratory failure (ARF & CRF)**

- 1. ARF
  - 1.1. Physiology and pathophysiology of ARF
  - 1.2. Respiratory pump function and dysfunction
  - 1.3. BGA

- 1.4. Difference between hypoxia and hypoxaemia
- 1.5. Imaging (*e.g.* chest X-ray)
- 1.6. National and international guidelines for treatment of ARF
- 1.7. Evaluation, performance, interpretation and reporting of BGA, O<sub>2</sub> saturation, transcutaneous CO<sub>2</sub> measurement, chest X-ray (imaging) and lung/chest wall mechanics
2. Hypoxemic respiratory failure including acute respiratory distress syndrome
  - 2.1. Causes of hypoxemic ARF
  - 2.2. Definition and classification of acute respiratory disease syndrome
  - 2.3. Ventilator- and tube-associated complications
  - 2.4. Ventilator-induced lung injury and intubation-associated pneumonia
  - 2.5. Protective MV
  - 2.6. Identification and management of hypoxemic ARF
  - 2.7. Indications for NIV in patients with hypoxemic ARF
  - 2.8. Risk assessment and management of NIV failure and indications for intubation
  - 2.9. Intubation and invasive MV
3. Acute and chronic hypercapnic respiratory failure
  - 3.1. Causes of respiratory failure
  - 3.2. Principles of interpretation of BGA
  - 3.3. National and international guidelines for treatment of acute and chronic hypercapnic respiratory failure
  - 3.4. Indications for additional O<sub>2</sub> treatment
  - 3.5. Indications for long-term (home) MV
  - 3.6. Management of patients with prolonged weaning
  - 3.7. Non-invasive MV
  - 3.8. Care for patients that are highly dependent on MV, *e.g.* those with a tracheostomy

**Module 32. Chronic hypercapnic respiratory failure**

1. Causes of respiratory failure
2. Principles of BGA interpretation
3. National and international guidelines for treatment of acute and chronic hypercapnic respiratory failure
4. Indications for additional O<sub>2</sub> treatment
5. Indications for long-term (home) MV

**Module 33. Interstitial lung disease (ILD)**

1. Identify ILD relevant to presentations of airway disease, *e.g.* hypersensitivity pneumonitis, sarcoidosis, idiopathic interstitial pneumonias, cryptogenic organising pneumonia (COP) of unknown aetiology/bronchiolitis obliterans organising pneumonia, connective tissue disease-related ILD, Langerhans cell histiocytosis, amyloidosis, lymphangioleiomyomatosis (LAM), pulmonary alveolar proteinosis, drug-induced disease, radiation-induced disease, non-asthmatic eosinophilic bronchitis, acute and chronic eosinophilic pneumonia and hypereosinophilic syndrome
2. Differential diagnosis and optimal testing
3. Choose the optimal treatment

**Module 34. Chronic cough**

1. Differential diagnosis
2. Diagnostic approach
3. Role of BHR, gastroesophageal reflux disease and sinusitis
4. Cough hypersensitivity syndrome
5. Psychogenic cough
6. Structured management and treatment of chronic cough

**Module 35. Sarcoidosis**

<ol style="list-style-type: none"> <li>1. Clinical aspects</li> <li>2. Diagnostic modality and treatment of different subtypes, including life-threatening organ involvement (heart, central nervous system and others)</li> </ol>
<p><b>Module 36. Idiopathic interstitial pneumonias</b></p> <p>Clinical features</p> <ol style="list-style-type: none"> <li>1. Diagnostic approaches and treatment of specific disorders</li> <li>2. Importance of holding an MDT meeting at least once per month</li> <li>3. Biological aspects</li> <li>4. COP of unknown aetiology/bronchiolitis obliterans organising pneumonia</li> <li>5. Assessment of small airways using a CT scan</li> </ol>
<p><b>Module 37. Connective tissue disease-related ILD</b></p> <ol style="list-style-type: none"> <li>1. Entities and network with rheumatologists (MDT)</li> <li>2. Biological aspects</li> </ol>
<p><b>Module 38. Langerhans cell histiocytosis</b></p> <ol style="list-style-type: none"> <li>1. Biology, clinical, radiological and laboratory features</li> <li>2. Diagnostics and molecular aspects</li> <li>3. New treatment modalities</li> </ol>
<p><b>Module 39. LAM</b></p> <ol style="list-style-type: none"> <li>1. Biology, clinical, radiological and laboratory features</li> <li>2. Diagnostics (Vascular Endothelial Growth Factor D – Precursor (VEGF-D), biopsy, <i>etc.</i>)</li> </ol>
<p><b>Module 40. Drug-induced disease</b></p> <ol style="list-style-type: none"> <li>1. List of drugs that commonly lead to lung disease</li> <li>2. Knowledge of the Pneumotox website</li> </ol>
<p><b>Module 41. Acute and chronic eosinophilic pneumonia</b></p> <ol style="list-style-type: none"> <li>1. Diagnosis and treatment</li> <li>2. Differential diagnosis of chronic eosinophilic leukaemia and idiopathic chronic eosinophilic pneumonia</li> </ol>
<p><b>Module 42. Hypereosinophilic syndrome</b></p> <ol style="list-style-type: none"> <li>1. Distinction of different subtypes according to molecular biology</li> </ol>
<p><b>Module 43. Differential diagnostics with asthma - thromboembolic disease</b></p> <ol style="list-style-type: none"> <li>1. Prophylaxis against thromboembolic disease             <ol style="list-style-type: none"> <li>1.1. Conditions/diseases associated with an increased risk of thromboembolic disease</li> <li>1.2. Adverse effects associated with anticoagulation therapy</li> <li>1.3. Interpretation of coagulation laboratory tests</li> <li>1.4. Drug indications and their appropriate dosages</li> </ol> </li> </ol>
<p><b>Module 44. Pulmonary hypertension and cor pulmonale</b></p> <ol style="list-style-type: none"> <li>1. Pathophysiology of pulmonary hypertension</li> <li>2. Pharmacological treatment of pulmonary hypertension according to the underlying disease</li> <li>3. Diagnosis of pulmonary hypertension and cor pulmonale</li> <li>4. Translating national and international management guidelines to an individual patient</li> <li>5. Appropriate decisions for referral and transfer to specialised referral centres</li> <li>6. Prognosis of patients with pulmonary hypertension in acute care settings</li> </ol>
<p><b>Module 45. Vasculitis</b></p> <ol style="list-style-type: none"> <li>1. Vasculitis with lung involvement</li> </ol>
<p><b>Module 46. Chest wall deformities</b></p> <ol style="list-style-type: none"> <li>1. Identify chest wall abnormalities as a cause of restrictive lung disease, respiratory failure and weaning failure</li> </ol>
<p><b>Module 47. Neuromuscular disorders</b></p> <ol style="list-style-type: none"> <li>1. Neuromuscular disease causing respiratory failure</li> <li>2. Neuromuscular conditions associated with respiratory muscle weakness</li> </ol>

3. Symptoms and signs of nocturnal hypoventilation and the probability of respiratory failure
4. Role of NIV *versus* invasive ventilation and cough augmentation (cough assist) techniques
5. Assessment of respiratory muscle strength (*e.g.* vital capacity)
6. Assessment of non-invasive respiratory muscle strength (*e.g.* mouth pressures and sniff inspiratory pressure)
7. Measurement of cough peak flow
8. Use of NIV
9. Clinical assessment of bulbar function

**Module 48. Diaphragmatic disorders**

1. Diaphragm weakness as a cause of respiratory failure and weaning failure
2. Differential diagnosis of diaphragm weakness
3. Therapeutic options for diaphragm weakness
4. Pathophysiology of critical illness associated with respiratory muscle weakness
5. Prevention of critical illness associated with respiratory muscle weakness
6. Ultrasonography as a tool for diaphragmatic assessment

**Module 49. Primary immunodeficiency syndromes**

1. Neutropenic patients
2. HIV-infected patients
3. Lung and other solid organ transplant recipients
4. Haematopoietic cell transplant recipients
5. Secondary immunodeficiency induced by drugs and biologicals
6. Primary immune deficiency syndromes

**Module 50. Cardiac disease**

1. Differentiate between cardiac and pulmonary disease as a cause of ARF
2. Differential diagnosis of cardiac causes of ARF

**Module 51. Gastrointestinal, liver and kidney disease**

1. Gastroesophageal reflux (asthma, IPF, chronic cough and other) and gastrointestinal management in ARF (ICU or intermediate care and non-invasive or invasive ventilation)

**Module 52. Obesity**

1. Management of obese patients
  - 1.1. Pathophysiologic effects of morbid obesity on the respiratory system (upper airways, respiratory mechanics and central respiratory drive)
  - 1.2. Principles of drug dosing in morbid obesity
  - 1.3. Recognition of obesity as a cause of respiratory impairment
  - 1.4. Interpretation of BGA and polysomnography results
  - 1.5. Initiation of non-invasive respiratory treatment
  - 1.6. Initiation of therapy for obesity-associated respiratory problems
2. SDB
  - 2.1. Physiology and pathophysiology of sleep relevant to ARF
  - 2.2. Diagnosis and screening of OSA, upper airway obstruction and hypoventilation
  - 2.3. Interpretation of blood gases and further tests for SDB
  - 2.4. Recognition of obesity as a cause of weaning failure in obese patients
3. Obesity hypoventilation syndrome
  - 3.1. Recognise the symptoms and clinical presentation and understand the pathophysiology of obesity hypoventilation syndrome
  - 3.2. Explain the consequences (polyglobulia and cor pulmonale)
  - 3.3. Define hypercapnic respiratory failure
  - 3.4. Explain OSA
  - 3.5. Evaluate and diagnose daytime hypercapnia by control of blood gases, transcutaneous capnography and body weight/clinical muscle assessment

- 3.6. Interpret blood gases
- 3.7. Assess indications for NIV; application or supervision of a mask and interface
- 3.8. Explain the illness and risk of obesity and offer advice about how to decrease BMI through physical activity, training and diet

**Module 53. CF**

1. Genetics of CF
2. Pathophysiology of CF
3. Systemic effects of CF (diabetes, malabsorption, liver problems, *etc.*)
4. Infection control
5. Infection surveillance
6. Universal precautions
7. Isolation and reverse isolation, including specific microbes in CF and bronchiectasis (*e.g.* Pseudomonas)
8. Infectious risks to healthcare workers

**Module 54.  $\alpha$ 1-antitrypsin deficiency**

1. Genetics
2. Incidence
3. Prevalence
4. Phenotypes
5. Screening
6. Associated diseases (liver)
7. Treatment options

**Module 55. Acute inhalation injuries and their possible sequelae**

1. Inhalation of smoke and chemicals (*e.g.* chlorine gas and mustard gas) and burns as causes of respiratory failure
2. Assessment of the degree of severity of pulmonary involvement
3. Optimal treatment of inhalation injury, including systemic effects

**Module 56. Indoor and outdoor air pollution**

1. Prevalence and incidence of thoracic malignancies in areas with air pollution
2. Air pollution factors that cause lung cancer
3. Potential mechanisms underlying carcinogenicity of compounds related to air pollution
4. Regulatory issues
5. Relationship between cancer and air pollution
6. Relationship between air pollutants and thoracic malignancies
7. Identify patients with considerable exposure to air pollution carcinogens
8. Identify symptoms caused by a patient's exposure to air pollution
9. Impact of air pollution in thoracic malignancies to patients and their families in a clear and understandable manner
10. Support campaigns for the prevention of air pollution
11. Feedback to public health authorities regarding concerns about clustering of cases
12. Discourage patients from emitting indoor/outdoor air pollutants
13. Support task forces/initiatives for the elimination of air pollution

**Module 57. High altitude and diving**

1. Identification of high altitude-induced sleep apnoea
2. High altitude and flights: contraindications and precautions for patients with airway diseases and overt/latent respiratory failure