Continuing professional development
Respiratory Infections

Module 1. Anatomy and development of the respiratory system including malformations

1. Pleura
2. Lungs
3. Bronchopulmonary segments
4. Trachea and bronchi
5. Hila
6. Pulmonary vasculature and lymphatic drainage
7. Mediastinum
8. Diaphragm
9. Pulmonary lobules (site of infections can be lobar or segmental specific)

Module 2. Immunology and defence mechanisms

1. Ciliary mechanisms
2. Anatomical barriers (including epithelial barrier function and how this is influenced by pathogens)
3. Innate immune defence mechanisms, e.g. recognition of pathogen-associated molecular patterns by structural cells (airway epithelium) and subsequent anti-microbial and pro-inflammatory responses
4. Reflex mechanisms (sneezing, cough and dyspnoea)
5. Mucociliary clearance and fluid homeostasis
6. Innate defence mechanisms (broad outline): professional phagocytes
7. Acquired immune reactions with immunoglobulin and the role of IgM, IgG and IgA
8. IgG subclasses and IgE
9. Type 1 and type 2 inflammation
10. Granulomatous inflammation/fibrosis induced by the cell-mediated immune response

Module 3. Ventilation

1. Physiology of tidal breathing: active inspiration and passive expiration
2. Relative elastic properties of the lungs and chest wall
3. Lung volumes
4. Transpulmonary pressures and breathing

Module 4. Arterial blood gas (ABG) and acid-base status assessment

1. Step 1: Evaluate the utility of ABG, capillary blood gas and venous blood gas
2. Step 2: Diagnosis of A-B disorders: Henderson-Hasselbalch equation and the relationship between arterial pressure of oxygen (PaO_2), partial pressure of carbon dioxide (PCO_2) and pH
3. Step 3: A-B disorders: importance of the D(A-a) difference, fraction of inspired oxygen (FiO_2), the alveolar gas equation and measuring oxygen shunts
4. Management of clinical diseases, *e.g.* COPD and sepsis with A-B disorders in ABG
5. Ventilation-perfusion defect

Module 5. Symptoms

1. Cough
2. Colour and nature of sputum (clear mucoid, purulent, haemoptysis, *etc.*)
3. Pleuritic chest pain
4. Fever *versus* night sweats
5. Wheezing
6. Haemoptysis (streak/blob, associated sputum, quantity and massive haemoptysis)
7. Chest wall pain
8. Fatigue/malaise
9. Dyspnoea
10. Weight loss

Module 6. Signs

1. Temperature
2. Finger clubbing
3. Cyanosis
4. Respiratory rate
5. Saturation
6. Heart rate
7. Hypotension and shock
8. Consolidation
9. Pleural effusion
10. Accessory muscle use
11. Wheezing and stridor

Module 7. Syndrome-based approach to diagnosis and differential diagnosis

1. Common upper respiratory tract syndromes (including acute infective rhinitis, sinusitis, pharyngitis, epiglottitis and laryngotracheitis)
2. Acute bronchitis
3. Exacerbation of asthma
4. Exacerbation of COPD
5. Community-acquired pneumonia (CAP) including nursing home-acquired pneumonia (NHAP)
6. Nosocomial pneumonia
7. Seasonal influenza
8. Acute bronchiolitis
9. Exacerbation of bronchiectasis
10. Pulmonary TB

Module 8. Bronchoscopy

1. Bronchoalveolar lavage (BAL)
2. Brushing samples
3. Protected sampling in an intensive care unit (ICU) to prevent upper airway contamination
4. Biopsy for culture

Module 9. Endobronchial ultrasound (EBUS) and oesophageal ultrasound (EUS)

1. Transbronchial lung biopsy cultures, and culture and analysis of transbronchial needle aspirates (for differential diagnosis)
2. GeneXpert

Module 10. Thoracentesis

1. Indications
2. Knowledge of indications for thoracentesis and biopsy
3. Thoracentesis
4. Interpretation of results
5. Biochemical analysis for differential diagnosis

Module 11. Thoracoscopy

1. Indications
2. Medical thoracoscopy with biopsy: indications
3. Pleural fluid and pleural biopsy samples for culture

Module 12. Chest X-ray

1. Miliary TB pattern
2. Mediastinal lymph nodes
3. Lung cavities
4. Halo-sign
5. Septic emboli
6. Abscess
7. Hydatid cyst

8. Sequestrum
9. Signs of pleural infection/parapneumonic effusion
10. Atelectasis signs
11. Signs of bronchiectasis
12. Consolidation and air bronchogram sign
13. Ground glass opacities
14. Solitary nodule

Module 13. Thoracic ultrasound

1. Thoracic ultrasound to guide thoracentesis/aspiration
2. ICU patients that cannot be moved
3. Pneumonia diagnosis
4. Empyema diagnosis
5. Complicated parapneumonic effusion

Module 14. Computed tomography scan

1. Aspergillus-related appearances
2. Tree-in-bud sign and infections
3. Bronchiectasis
4. Non-resolving pneumonia
5. Cryptogenic organising pneumonia
6. Empyema
7. Mediastinal lymph nodes
8. Bronchopleural fistula
9. Radiological signs of:
   9.1. Diseases associated with Aspergillus
   9.2. Non-tuberculous mycobacteria (NTM)

Module 15. Sputum assessment

1. Common pathogens and their antibiotic sensitivities
2. Samples and specific pathogens
3. Acid-fast bacilli: number, interpretation of quality, sputum induction indication and culture *versus* immunofluorescence (IF) *versus* PCR
4. Likelihood of a laboratory report being correct (*e.g.* Gram-negative pathogens or gonococcal pharyngitis); Nocardia as an acid-fast organism
5. Whole-genome sequencing (WGS) and targeted next-generation sequencing of *Mycobacterium tuberculosis* and other mycobacteria
6. GeneXpert

Module 16. Basic microbiological methods

1. Conventional microbiological methods such as Gram staining, culture and sensitivity testing for different pathogens, such as atypical bacteria, viruses and fungi, and for P*neumocystis jirovecii pneumonia* (known in the past as Pneumocystis carinii pneumonia (PCP))
2. Indications for and collection of biological specimens, Gram staining, culture, molecular methods, IF and genetic testing
3. Interferon gamma release assay, interpretation of microbiological results provided by BAL, quantitative culture, particularities in immunocompromised patients, particularities in nosocomial infection and types of sputum harvest (spontaneous, induced and bronchial aspirate)
4. Airway microbiome in relation epigenetic and transcriptomic profiles in lung tissue
5. Microbiologic diagnosis of TB (smear examination, liquid and solid culture media, molecular study of resistance and phenotypic/genotypic methods)

Module 17. Inhaled drug therapy

1. Problems with inhaled therapy
2. When to use inhaled drugs, *e.g.* amikacin in bronchiectasis

3. Delivery modules
4. Indications and application at an ICU

Module 18. Systemic pharmacotherapy

1. Interpreting laboratory results and choosing antibiotics
2. Use of antivirals in flu epidemics
3. Antibiotic stewardship and adherence to guidelines
4. Place of corticosteroids
5. Pharmacokinetics and pharmacodynamics

Module 19. Respiratory physiotherapy

1. Role of physiotherapy in sputum induction
2. Postural drainage in bronchiectasis
3. Muscle strengthening
4. Aerobic exercise as a method for airway clearance

Module 20. Pulmonary rehabilitation

1. Rehabilitation and airway clearance to help reduce exacerbations of chronic respiratory diseases such as COPD and bronchiectasis
2. Prevention of infections

Module 21. Palliative care

1. Oxygen therapy
2. Sedation
3. Pain therapy

Module 22. Preventative measures

1. Vaccinations
   1.1. Influenza
   1.2. Pneumococcal
   1.3. Bacillus Calmette–Guérin (BCG)
   1.4. Other vaccinations
2. Smoking cessation
3. Dental care
4. Aspiration management
5. Infection control
6. Cough hygiene
7. Infection surveillance
8. Universal precautions for respiratory isolation
9. Isolation and reverse isolation, including specific microbes in cystic fibrosis (CF) and bronchiectasis (*e.g.* Pseudomonas)
10. Infectious risks to healthcare workers (HCWs): control and elimination of TB including the BCG vaccine
11. Segregation under infection control and relevance to CF and TB
12. Study of TB patient contacts, TB isolation criteria and indications for diagnosis and treatment of TB
13. Role of air pollution

Module 23. Chest tube insertion

1. Empyema
2. Indications for and management of chest tube insertion
3. Endopleural lysis

Module 24. Lung transplantation

1. Course of opportunistic infections after lung transplantation
2. Differentiation between organ rejection and infection
3. Prophylaxis
4. Post-transplant management

Module 25. Evaluation of respiratory emergencies
1. CAP
2. Hospital-acquired pneumonia (HAP)
3. Sepsis
4. Bioterrorism

Module 26. Differential diagnosis
1. Differential diagnosis using clinical and radiological findings of infectious diseases (*i.e.* those caused by bacteria, viruses, fungi, mycobacteria and other difficult-to-treat microorganisms) in contrast with those of non-infectious disorders

Module 27. Immediate management steps
1. Time to first intravenous antibiotics
2. Use of oxygen (pneumonia *versus* COPD)
3. Sepsis

Module 28. Guidelines for first-line treatment of:
1. CAP
2. HAP
3. Ventilator-associated pneumonia (VAP)
4. NHAP

Module 29. Upper airway diseases
1. Common upper respiratory tract syndromes (including acute infective rhinitis, sinusitis, pharyngitis, epiglottitis, laryngotracheitis and tonsillitis)
2. Allergies and the upper respiratory tract

Module 30. Asthma
1. Molecular mechanisms of exacerbation
2. Infectious management of exacerbation
3. Allergic bronchopulmonary aspergillosis
4. Infectious causes of eosinophilia

Module 31. Bronchitis
1. Acute bacterial and viral bronchitis

Module 32. COPD and emphysema
1. Molecular mechanisms of exacerbation
2. Infectious management of exacerbation, *i.e.* viral and bacterial
3. Immunomodulatory therapy
4. Risks associated with inhaled corticosteroids
5. Vaccination
6. Bacterial colonisation
7. Long-term macrolides

Module 33. Bronchiolitis
1. Respiratory syncytial virus
2. Differential diagnosis
3. Other viruses and bacteria

Module 34. Bronchiectasis
1. Diagnostic and aetiological work-up
2. Management of exacerbation
3. Bacterial and non-bacterial surveillance
4. Eradication
5. Long-term antibiotic and immunomodulatory therapy
6. Vaccination
7. Rehabilitation
8. Respiratory physiotherapy

9. Classification severity
10. Haemoptysis and management

Module 35. Lower respiratory tract infections

1. CAP (including NHAP and HCAP))
2. Nosocomial pneumonia
3. Specific risk factors

Module 36. Pleural infections

1. Diagnostic methods in radiology and ultrasound parapneumonic effusion and empyema pleuritis
2. Indication for large-bore pleural drainage
3. Indication for medical and surgical thoracoscopy
4. Evaluating the accuracy of microbiological methods

Module 37. Lung abscesses and other infections

1. Choice and duration of antibiotic treatment in particular situations, such as intravenous drug users, and aspiration
2. Surgical intervention

Module 38. Influenza, pandemics and severe acute respiratory syndrome prophylaxis

1. Population groups with a worse prognosis
2. Infection control
3. Medical treatment

Module 39. Infections in an immunocompromised host

1. PCP
2. Empirical antibiotic selection and treatment particularities in patients with acquired immunodeficiency, neutropenic patients, patients with solid organ malignancy, lung and other solid organ transplant recipients, haematopoietic cell transplant recipients, patients with other haematological conditions, patients with secondary immunodeficiency induced by drugs and biologicals and patients with primary immune deficiency syndromes
3. Antibiotic prophylaxis
4. Indication for immunoglobulins
5. Role of invasive diagnostic testing
6. Diabetes
7. Lupus
8. Fungal infections
9. Pulmonary TB

Module 40. Aspiration pneumonitis

1. Choice of antibiotics
2. Prognosis
3. Supportive care
4. Preventative measures
5. Risk factors for aspiration pneumonitis

Module 41. Pulmonary TB including multidrug-resistant/extensively drug-resistant (MDR/XDR) TB

1. Consideration of TB in the differential diagnosis of respiratory infections
2. Epidemiology, burden of disease and risk factors: know when to investigate and what tests to ask for
3. Indication for isolation and discontinuation of isolation
4. Risk factors for MDR/XDR TB
5. Drug susceptibility and treatment
6. Directly observed therapy (DOT) / Video observed therapy (VOT)
7. Miliary TB
8. Adverse events (AEs)
9. Diagnostic tests

10. Molecular tests
11. WGS

Module 42. Extrapulmonary TB

1. Differential diagnosis
2. Diagnosis of lymphatic TB and indication for EBUS
3. Rate of associations with pulmonary TB
4. Role of immunological tests for increasing the probability of diagnosis in patients with relevant risk factors and symptoms
5. Pleural TB

Module 43. Latent TB infection

1. Diagnosis
2. Contact investigation
3. Treatment
4. Surveillance of side effects
5. Alternative regimens in case of AEs
6. Treatment of latent TB infection in immunocompromised patients
7. Selection of candidates to treat

Module 44. Non-TB mycobacterial diseases

1. Adherence to diagnostic criteria
2. Indication for treatment
3. Treatment
4. Monitoring of drug responses including relapse, re-infection and cure
5. Epidemiology and risk factors for NTM
6. Clinical presentation of NTM diseases
7. HIV co-infection
8. Immunosuppression

Module 45. Acute respiratory failure

1. Management of pneumonia
2. Rationale for the use of guidelines for antibiotic therapy
3. Management of severe exacerbation of COPD

Module 46. Mediastinitis

1. Differential diagnosis and testing
2. Treatment
3. Antibiotics
4. When to perform surgery
5. Oesophageal perforations
6. Transoesophageal fistulae

Module 47. Primary immunodeficiency syndromes

1. Patterns of pulmonary involvement in primary immunodeficiency disorders
2. Recognition, assessment and management of the severity of respiratory disease in patients with primary immunodeficiency disorders
3. Appropriate vaccination and prophylaxis regimens
4. Emphasise the most common primary immunodeficiency syndromes

Module 48. Secondary immunodeficiency syndromes/immunosuppression

1. Indications for screening

Module 49. CF

2. Diagnosis and differential diagnosis
3. Infection control and cross-infection
4. Infection surveillance
5. Microbiological evaluation

6. Universal precautions
7. Isolation and reverse isolation
8. Physiotherapy
9. Particularities in treatment (pharmacokinetics)
10. Immunomodulatory drugs
11. Antibiotic management for eradication
12. Suppression
13. Acute exacerbation
14. New CF transmembrane conductance regulator (CFTR)-specific medications
15. Non-respiratory management
16. CFTR modulators
17. NTM infections in CF
18. When and how to go for screening

Module 50. Genetic susceptibility to respiratory infections

1. Differential diagnosis and recognition of primary ciliary dyskinesia
2. Diagnostic testing
3. Diagnosis of primary ciliary dyskinesia
4. α1-antitrypsin

Module 51. Occupational respiratory infections in HCWs

1. Hepatitis
2. TB screening in HCWs
3. TB prevention in HCWs
4. TB infection control training for HCWs
5. Precautions for pregnant HCWs: measles, influenza and TB
6. Zoonosis
7. Influenza in exposed HCWs

Module 52. Epidemiological and statistical methods for critical appraisal

1. Assessment of national TB programme

Module 53. Lifestyle

1. Alcohol abuse
2. Smoking including electronic cigarettes, marijuana and water pipes