Pulmonary Learning Objectives
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I. General Learning Objectives

A. Clinical Skills Learning Objectives

1. Perform a competent pulmonary history and physical exam.
2. Recognize the classic physical findings of the following pathologies: pleural effusion, consolidation, pneumothorax, atelectasis, bronchospasm and fibrosis
3. Evaluate respiratory/ventilatory/oxygenation status + obtain relevant and appropriate data to shape management
2. Recognize + define SIRS, sepsis, septic shock, severe sepsis (in MICU curriculum)
3. Identify the indications for the various types of NIPV
4. Apply early goal directed therapy + the DREAM protocol to floor patients prior to MICU transfer

B. Interpersonal Learning Objectives

1. Accurately identify the risks and benefits of pulmonary procedures (chest tubes, thoracentesis, pleurodesis) and describe these to patients
2. Differentiate comfort care from DNR/DNI
3. Identify indications to call palliative care consult
4. Initiate key interventions (nursing, environmental + medical) to increase comfort at time of death

C. Procedural Learning Objectives

1. Perform and interpret ABGs
2. Observe and perform thoracentesis; interpret Light's criteria
    a. http://eresources.library.mssm.edu:2368/cgi/content/short/355/15/e16
3. Order appropriately and Interpret the basic values on PFTs and Spirometry
4. Manage chest tubes
5. Identify failed pleurodesis

Intern Focused Topics*

II. Medical Knowledge Learning Objectives

~Asthma, COPD, Pneumonia, Pulmonary Embolism are covered in the General Medicine Learning Objectives

A. **Acute or Chronic Bronchitis***

1. Identify common causes: viral or bacterial infection, medication non-compliance, allergy
2. Understand the role of antibiotics, steroids, bronchodilators, oxygen supplementation and occasionally mechanical ventilation
   ARTICLES
    a. NEJM 343:1715, Dec7,2000. Review Article. "Diagnosis + treatment of cough" → PMID 11106722
    b. NEJM 355:2125, Nov 16,2006. Clinical Practice. "Acute Bronchitis" → PMID 17108344

B. **Pneumothorax – spontaneous vs chronic pleural effusion vs iatrogenic***

1. Define the incidence/prevalence
2. Differentiate the indications for chest tube vs needle aspiration, blood patch, referral to surgery

3. Understand the physiology of the pleurovac system + identify daily what should be monitored daily on physical exam + the pleurovac
   ARTICLES
   a. Semin Respir Crit Care Med. 2008 Aug;29(4):427-40. “Pleural interventions: management of acute and chronic pneumothorax.” → PMID 18651360
   b. Clinics in Chest Med. 2006 Jun; 27(2):369-81. Review. "Management of spontaneous pneumothorax." → PMID 16716824

C. Sarcoidosis*

1. Identify clinical manifestations and other possible involved organ systems
2. Recall radiographic staging of disease
3. Evaluate the indications for steroids
   ARTICLES
   a. N Engl J Med 357:2153, November 22, 2007 Review Article. “Sarcoidosis” → PMID 18032765

D. ARDS*

1. Define this disease entity by radiology, lung mechanics, gas exchange and hemodynamics
2. Consider the role of cytokines
3. Identify common precipitating factors
4. Evaluate + implement key management issues including ventilation settings + corticosteroids
   ARTICLES:
   a. NEJM 342: 1334, May 4, 2000. Review Article “The Acute Respiratory Distress Syndrome” → PMID: 10793167
   b. NEJM 357: 1113, Sept 13, 2007. Clinical Therapeutics. “Low Tidal Volume Ventilation in ARDS” → PMID: 17855672
   c. NEJM 342:1301, May4,2000. Original Article. “Ventilation with lower TVs as compared with traditional TVs for ALI and ARDS” → PMID 10793162
   d. NEJM 354:1671, April 20, 2006. Original Article. “Efficacy and safety of corticosteroids for persistent ARDS.” → PMID 16625008

E. Pulmonary Hypertension*

1. Identify the typical patient + presentation
2. Identify the key findings on physical exam + imaging (JVP, CXR, EKG, PFTs, TTE/TEE)
3. Recall indications for the 6 minute walk test + understand it’s implications
4. Understand how to diagnose pulmonary hypertension on right heart cath; what is the pathophysiology of a nitric oxide trial
5. Recognize how the RHC/nitric oxide response affects treatment (i.e., CCB or not)
6. Understand the physiology of other treatments as well as how to monitor patients on these therapies: remodeling agents, prostacyclin agonists, or vasodilators
   ARTICLES
   a. N Engl J Med 351:1655, October 14, 2004 Review Article. “Pulmonary arterial HTN.” → PMID 15483284
   b. NEJM. 2005 Nov 17;353(20):2148-57. "Sildenafil citrate therapy for pulmonary arterial HTN." --> PMID 16291984
   c. NEJM. 2002 Mar 21;346(12):896-903. "Bosentan therapy for pulmonary arterial HTN." --> PMID 11907289
   d. Circulation. 2006 Sep 26;114(13):1417-31. "Pulmonary artery HTN." --> PMID 17000921

F. Pleural disease: infectious vs malignant vs undiagnosed*

1. Recall Light’s criteria for transudative vs exudative effusions and differentiate the two
2. Know the differences in cellular composition and its use in diagnosis

3. List common diseases for each type of effusion
4. Consider the sequence of diagnostic procedures: thoracentesis, biopsy, VATS, pleurodesis

ARTICLES

a. N Engl J Med 346:1971, June 20, 2002 *Clinical Practice. "*Pleural Effusion." → PMID 12075059
b. Chest. 2000 Oct; 118(4):1158-71. "Medical and surgical treatment of parapneumonic effusions: an evidence based guideline." → PMID 11035692
c. Am J Respir Med. 2003;2(3):261-73. "Management of malignancy-associated pleural effusion: current and future treatment strategies"→ PMID 14720007

G. **Non-Invasive Pulmonary Testing***

1. Differentiate the indications for PFTs vs spirometry vs cardiopulmonary testing
2. Interpret the data these tests provide

ARTICLES

a. Clinics in Chest Medicine. 1989 Jun; 10(2):227-37. "Arterial blood gases." → PMID 2661120
b. UpToDate. "Overview of pulmonary function testing in adults."
c. NEJM 331(1):25-30, July 7, 1994 *Review Article. "*Pulmonary Function Testing" →PMID 8202099

H. **Non-Invasive Positive Ventilation***

1. Understand the difference escalation of NIPV available
2. Compare/Contrast BiPAP versus CPAP
3. Identify diseases in which each of these are indicated
4. List contraindications to NIPV

ARTICLES

a. Crit Care Med. 2007 Oct;35(10):2402-7. "Noninvasive ventilation in acute respiratory failure" → PMID 17717495
b. NEJM. 2004 Jun 10;350(24):2452-60. "Noninvasive ventilation for respiratory failure after extubation." --> PMID 15190137
c. NEJM 2001 Jun 28;344(26):2027-8. "Noninvasive ventilation in immunosuppressed patients." --> PMID 11430335
d. NEJM. 2008 Jul 10;359(2):142-51. "Noninvasive ventilation in acute cardiogenic pulmonary edema." --> PMID 18614781

I. **Idiopathic ILD**

1. List key points to be elicited during the history (occupational, family, etc)
2. Identify the subgroups of idiopathic ILD: DIP(desquamative interstitial pna)/RBILD(respiratory bronchiolitis w/ILD), UIP, AIP (acute), NSIP (nonspecific)
3. Understand how to diagnose ILD – and when to order a HRCT

ARTICLES

a. NEJM. 2001 Aug 16; 345(7):517-25. "Idiopathic Pulmonary Fibrosis." → PMID 11519507
b. Clinics in Chest Medicine. 2006 Mar;27(1 Suppl 1):S17-25,v-vi. "Evolving concepts in the early and accurate diagnosis of idiopathic pulmonary fibrosis." → PMID 16545629
c. Clinics in Chest Medicine. 2004 Dec;25(4):759-72, vii. "Medical treatment for pulmonary fibrosis: current trends, concepts, and prospects." → PMID 15564021

J. **Non-Idiopathic ILD**

- Categorize this broad disease entity into pathophysiologic subgroups:
    1. Pneumoconiosis: Coal worker's lung, asbestos, silica, beryllium
    2. Hypersensitivity pneumonitis --> triggers include: bacteria, fungi, animal protein
    3. Collagen vascular
    4. Vasculitis: Wegners, allergic granulomatosis, Churg-Strauss/angiitis

5. Complications of vasculitis: Diffuse Alveolar Hemorrhage + Goodpasture's syndrome (DAH + glomerulonephritis)
6. Drug-induced → Chemotherapy, antimicrobials, cardiovascular meds, ASA, illicit substances, tocolytics
7. Radiation
8. Eosinophilic granuloma (histiocytosis X)
    1. CXR findings
    2. Risk for PTX
    3. Associated w/tobacco
9. Lymphangio-leiomyomatosis
    1. Demographics: premenopausal women
    2. DAH risk
    3. Acceleration w/pregnancy
10. BOOP (bronchiolitis obliterans w/organizing pna)
    1. Pathophys: thought to be pulmonary injury → identify causes of injury
    2. Characteristic pathology leading to characteristic CXR findings
    3. Treatment + Prognosis
11. Pulmonary infiltrates w/ eosinophilia
12. Loeffler's syndrome – cause + treatment
13. Drug-induced Injury
14. ABPA - Allergic Bronchopulmonary Aspergillosis– presentation, diagnosis and treatments

    ARTICLES
    a. UpToDate. "Approach to the adult with interstitial lung disease."
    b. Search for disease specific articles or ILD + typically associated comorbid disease

K. **Cystic Fibrosis**

1. Recall the genetics: autosomal recessive, which single gene mutation + how this leads to the pathology
2. List the organisms with which these patients are most commonly colonized
3. Recognize that this is not only a disease of the lungs – which other organ systems are involved?
4. Know how to diagnose this disease
5. Describe effective treatments: airway hygiene vs nutritional support vs abx/bronchodilators/DNAse/inhaled tobramycin vs lung tx vs gene therapy
6. Define peri-operative workup + indications for transplant

   ARTICLES
   a. BMJ. 2007 Dec 15;335(7632):1255-9. "CF." → PMID 18079549
   b. Am J Respir Crit Care Med. 2008 May 15;177(10):1058-61. "Update in CF 2007" → PMID 18460460
   c. Thorax. 2008 Feb;63(2):180-4. "Exacerbations in CF: Management." → PMID 18234661
   d. Curr Opin Pulm Med. 2008 Nov;14(6):589-94. "Selection of CF patients for lung transplantation." → PMID 18812837

L. **Bronchiectasis**

1. Define this disease + common causes + classic CXR findings
2. Identify treatments that have been shown to benefit non-CF patients
3. Understand the evidence for/against antibiotics, anti-inflammatories, immunosuppressants
4. Recognize the variables affecting prognosis

   ARTICLES
   a. Chest. 2008 Oct;134(4):815-23. "Bronchiectasis." → PMID 18842914

M. **Lung Transplant**

1. Understand what is entailed in the work-up for lung transplant + why these tests are important (ex, CMV status)
2. Identify the common types of lung surgeries (volume reduction vs single lung tx vs bilateral lung tx or lobe tx) and the indications for these different types of surgeries
3. Differentiate which surgeries have the best M&M for which disease processes
4. Compare the M&M for lung transplant to other commonly transplanted organs (heart, kidney)
5. Identify post-transplant complications
   ARTICLES
   a. N Engl J Med. 1999 Apr 8;340(14):1081-91. "Lung transplantation." → PMID 10194239
   b. Proc Am Thorac Soc. 2009 Jan 15;6(1):94-100. "Infections relevant to lung transplantation." → PMID 19131534
   c. Proc Am Thorac Soc. 2009 Jan 15;6(1):20-7. "Selection of candidates for lung transplantation." --> PMID 19131527

N. **Mediastinal disease**

1. Recall what lies in the anterior vs middle vs posterior compartments
2. List the diseases that can be found in these compartments
3. Identify how to best visualize/image each compartment
   ARTICLES
   a. Thoracic Surg Clin. 2009 Feb;19(1):29-35, vi. "Diagnostic strategies for mediastinal tumors and cysts." → PMID 19288818
   b. UpToDate. "Evaluation of mediastinal masses."

O. **Bronchoscopy**

1. Identify the uses and interpretation
   ARTICLES
   a. Chest. 1999 Nov; 116(5):1403-8. "Advances in bronchoscopic procedures." → PMID 10559105

P. **Other Environmental Lung Injuries**

1. Air pollution: sulfur oxides, ozone, nitrogen dioxide → just know these exacerbate underlying lung disease by bronchoconstriction
2. Noxious gases + fumes
   a. Carbon dioxide, nitrogen, methane → cause asphyxia by replacement of alveolar oxygen
   b. Carbon monoxide
      1. Note the levels at which different organs are affected
      2. How to diagnose using ABG
      3. What is the evidence for hyperbaric treatment
   c. Smoke inhalation
      1. Identify the mechanisms of injury + treatment options
      2. List the long term complications + their likelihoods
   d. High Altitude
      1. HAPE (High altitude pulmonary edema)
   e. Drowning
      1. Identify the physiologic mechanisms of survival