Rotation Title: Anesthesiology for Thoracic Surgery

I. Definition: This rotation is an integral part of the CV rotations in the CA-2 year or CA-3 year that focuses on elements of Anesthesiology for thoracic surgery, including bronchoscopy, mediastinoscopy, thoracotomy, lung resection, pneumonectomy, lung volume reduction and heart-lung transplantation. The OR manager rotation should be used to further perfect these skills.

II. Curriculum: The rotation provides clinical experiences with all elements of thoracic Anesthesiology, including preoperative assessment, consultation, line placement, thoracic epidural analgesia, double lumen endotracheal tube placement and position confirmation, fiberoptic bronchoscopy, and one lung ventilation.

III. Performance Assessments:

A. Self Assessment
You (the resident) are to check off each criterion as the material is mastered. Self reflection on your own competencies is critical.

B. Faculty Assessment
Faculty will periodically review your self assessment and discuss their assessments of your competencies. The overall scores on the six competencies will be reported to you at least weekly.

C. Mentor Assessment
Your mentor should meet with you quarterly and review your entire portfolio. The mentor should report areas in which you have deficiencies (for your level of training). This report may be to you and/or to the program director as determined by your mentor.

IV. Competencies Assessed (Performance Criteria):

A. Patient Care: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Identification of patient risk factors
2. Ordering of appropriate preoperative testing
3. Performance of consultative services
4. Routine placement of arterial and central lines
5. Successful placement of double lumen endotracheal tubes in the most (>75%) patients
6. Application of one lung ventilation with minimal staff assistance
7. Transfer thoracic patients to the PACU and CVICU with minimal staff assistance
8. Recognition of acute respiratory failure
9. Safe reintubation of patients after thoracotomy when indicated
10. Recognition of massive intrathoracic bleeding
11. Initiation of appropriate analgesia after thoracic surgery

B. Medical Knowledge: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Indications for thoracic surgery
2. Preoperative assessment for thoracic surgery
3. Lung volume reduction and prediction of the outcome of pneumonectomy
4. One lung ventilation and understanding the indications for lung isolation
5. Flow-volume loops
6. Understanding the risks of prolonged intubation

7. Physiologic responses to major lung resection and pneumonectomy
8. Reexpansion pulmonary edema
9. Chest tube management
10. Techniques of epidural analgesia for thoracic surgery
11. Analgesia and respiratory mechanics
12. Chronic lung disease
13. Lung transplantation
14. Respiratory failure

The resident on their anesthesia for thoracic surgery rotation shall be responsible for mastering all material listed in Appendix A. These will be assessed by written and oral examinations.

C. Practice Based Learning and Improvement: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Comprehending the state of the surgical procedure quickly by observation and interaction with the surgical team
2. Determining the status and outcome of patients anesthetized by the resident.
3. Reviewing the surgical procedure and anesthetic of completed cases and compare with the anesthetic plan to determine whether the best plan had been formulated
4. Track case counts showing involvement in variety of cases so that comfort level extends to all types of intrathoracic surgeries
5. Becoming acquainted with thoracic anesthesia and thoracic surgery literature
6. Reviewing scientific evidence for the appropriate surgical and anesthetic care of the patient having intrathoracic surgery. This should be done at least weekly. A copy of this report may be placed in your portfolio.

D. Interpersonal and Communication Skills: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Ability to work with the surgical team to determine appropriate anesthetic for case
2. Ability to discuss intraoperative events and complications with surgeon in a timely manner
3. Appropriate preoperative, intraoperative and perioperative discussions with staff anesthesiologists about cases

E. Professionalism: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Demonstration of appropriate interest in case by proper preoperative preparation
2. Demonstration of excellent patient care by interactions with patient and families
3. Soliciting imput from respiratory therapists in a collegial fashion

F. Systems-Based Practice: During the course of this rotation, the resident is expected to show increasing competency in each of the following …

1. Resident should understand the role of intrathoracic surgery in the health maintenance of the elderly
2. Resident should review cancer resources available in the community
3. Resident should consider ethics of transplantation

Revised: **June 7, 2007**

Appendix A: Medical Knowledge expected to be mastered during the Anesthesia for Thoracic Surgery Rotation

Lecture 54

Respiratory Physiology – Part 1

Respiration: Lung Functions and Cellular Processes

1) Lung Volumes
   - (a) definitions; methods of measurement; normal values; time constants
   - (b) spirometry; static and dynamic volumes; deadspace; nitrogen washout, O_2 uptake, CO_2 production, exercise testing

2) Lung Mechanics
   - (a) static and dynamic compliance, pleural pressure gradient, flow-volume loops and hysteresis, surfactant, LaPlace Law
   - (b) resistances; principles of gas flow measurement
   - (c) methods of measurement
   - (d) work of breathing
   - (e) regulation of airway caliber

Lecture 55

Respiratory Physiology – Part 2

1) Ventilation - Perfusion
   - (a) distribution of ventilation
   - (b) distribution of perfusion, zones, hypoxic pulmonary vasoconstriction
   - (c) measurement of Ventilation/Perfusion (V/Q) ratio, implications of Alveolar-arterial O_2 gradient (A-aDO_2), arterial-Alveolar CO_2 gradient (a-ADCO_2), dead space to Tidal Volume Ratio (V_d/V_t), Shunt Fraction (Q_s/Q_t), lung scan

2) diffusion
   - (a) definition, pulmonary diffusion capacity
   - (b) apneic oxygenation, diffusion hypoxia

Lecture 56

Respiratory Physiology – Part 3

1 Blood Gas Transport
   - (a) O_2, transport; O_2 physical solubility; oxyhemoglobin (Hb-O_2) saturation, Hb-O_2 dissociation curve; 2,3-diphosphoglycerate (2,3,DPG), P_{50}, respiratory enzymes; hemoglobin (Hb) as a buffer
   - (b) CO_2 transport; blood CO_2 content; carbonic anhydrase; CO_2 dissociation curve; Bohr effect, Haldane effect
   - (c) systemic effects of hypercarbia and hypocarbia
   - (d) systemic effects of hyperoxia and hypoxemia

2) Regulation of Ventilation
   - (a) respiratory center
   - (b) central and peripheral chemoreceptors; proprioceptive receptors; respiratory muscles and reflexes; innervation
   - (c) CO_2 and O_2 response curves

3) Non-respiratory Functions of Lungs, metabolic, immune

Lecture 57

Anatomy of the Respiratory System

1) Nose
2) Pharynx: Subdivisions; Innervation
3) Larynx
   - a) innervation; muscles; blood supply; cartilages
   - b) vocal cords, positions with paralysis
   - c) differences between infant and adult
4) Trachea
   - a) structure and relationships in neck and chest
5) Lungs
   - a) divisions and bronchoscopic anatomy
   - b) bronchial and pulmonary circulations
   - c) microscopic anatomy

6) Muscles of Respiration, Accessory Muscles

Lecture 59

Obstructive Respiratory Disease

1) upper airway: congenital, infectious, neoplastic, traumatic, foreign body, obstructive sleep apnea
2) tracheobronchial: congenital, infectious, neoplastic, traumatic, foreign body
3) parenchymal: asthma, bronchitis, emphysema, lung abscess, bronchiectasis, cystic fibrosis, mediastinal masses

Lecture 60

Restrictive Respiratory Disease

1) neurologic: CNS depression, spinal cord dysfunction, peripheral nervous system
2) musculoskeletal: muscular, skeletal, obesity, chest trauma
3) parenchymal: atelectasis, pneumonia, interstitial pneumonitis, pulmonary fibrosis, respiratory distress syndrome (ARDS), bronchopulmonary dysplasia
4) pleural and mediastinal: pneumo-, hemo-, and chylothorax, pleural effusion, empyema, bronchopleural fistula
5) other: pain, abdominal distention

Lecture 63

Perioperative Management of Respiratory Disease

1) monitoring
2) choice of anesthesia
3) anesthetic techniques: nonpulmonary surgery, thoracic and pulmonary surgery, one-lung ventilation, lung transplantation, thorascopic surgery
4) postoperative care: pain management, respiratory therapy, ventilator support, extubation criteria
5) lung transplantation: anesthetic implications

Lecture 124

Pharmacology of Anticoagulants, Antithrombotics and Anti-platelet Drugs

1) mechanism of action
2) comparison of drugs
3) drug interactions
4) monitoring of effects
5) side effects and toxicity

Lecture 126

Hematologic Disorders

1) disease of blood
   (a) anemias; compensatory mechanisms
   (b) potycythemias; primary vs. secondary
   (c) clotting disorders: congenital, acquired, pharmacologic (anticoagulants and antagonists)
   (d) hemoglobinopathies, porphyrias

Lecture 127

Transfusion Medicine

1) Transfusions
   (a) blood preservation, storage
   (b) blood filters and pumps
   (c) effects of cooling and heating; blood warmers
   (d) blood components, volume expanders
   (e) preparation for transfusion: type and cross, type and screen, uncrossmatched blood, autologous blood, designated donors
   (f) synthetic and recombinant hemoglobins
2) reactions to transfusions
   (a) febrile
   (b) allergic
   (c) hemolytic: acute and delayed
3) complications of transfusions
   (a) infections: hepatitis, human immunodeficiency virus (HIV), cytomegalovirus (CMV), others
   (b) citrate intoxication
   (c) electrolyte and acid base abnormalities
   (d) massive transfusion: coagutopathies, hypothermia
   (e) pulmonary, transufion-related acute lung injury
4) alternatives to tranfusion
   (a) hemodilution

(b) sequestration
(c) autotransfusion
(d) blood substitutes
(e) erythropoietin

Lecture 128

Acute Postoperative and Post-traumatic Pain

1) ASA Practice Guidelines

Lecture 159

Anesthesia for Trauma, Burn Management, Mass Casualty, Biological/Chemical Warfare