

## **Thoracic-A Format-D**

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### **General Instructions**

1. Read the question X 2.
2. Outline the question in 2 minutes.
3. Take the test, recording responses if possible. If you are self-testing, read the question and then answer. If you are tested by someone else, have them read the question and then answer.
4. Compare your outline to mine.
5. Compare your answers to mine, on paper (section D) and tape (tape set 3 of 3).

### **Testing Correction-Inspection: Ranger compare!**

A 56 year-old, 70 Kg, 5'8" tall male is brought to the operating room for a left upper lobectomy.

HPI: Patient noted the onset of a productive cough 6 weeks ago and an episode of hemoptysis 10 days ago. He was seen by a pulmonary specialist who noted a 2 cm mass in his left upper lobe on chest x-ray. Fiberoptic bronchoscopy revealed irregularity of the left upper lobe bronchus, and biopsy revealed carcinoma. Metastatic workup was negative.

PMH: Uncomplicated myocardial infarction 4 months ago. He notes angina with exercise over the past month. A stress test 7 days ago showed minimal ST segment depression at a heart rate of 120 beats per minute without angina. An echocardiogram revealed an ejection fraction of 55%.

Medications include diltiazem and nitroglycerin PRN. He has no allergies. He smoked 2 packs of cigarettes per day for 25 years until 10 days ago. He drinks an occasional beer.

Phys. Exam: P 72, BP 140/80, R 20, T 37.1° C. His airway appears normal. Chest auscultation reveals expiratory wheezes over left posterior upper lung field. Cardiac exam is normal. He has no organomegaly or peripheral edema.

Chest X-Ray: 2 cm mass and small infiltrate left upper lobe.

EKG: Q waves in II, III, aVf with T wave inversion in same leads.

Lab Studies: Hgb 14.5 gms/dl, normal electrolytes and normal coagulation studies.

He arrives in operating room at 10:00 AM with 1" nitropaste, having taken his diltiazem at 7:00 AM.

**Specific Instructions: Testing drill II:**

1. Compare the tape of yourself to the one of me. I hope it provides insight and indication as to progress.
2. Pay particular attention to answers in bold. These are spiels from our scripting. Are you bringing these into play? Scripting (for most) is better than ad libbing--the very reason actors have scripts!

Senior examiner: **James E. Eckenhoff, M.D.**, Chairman, Dept. of Anesthesiology, Northwestern University Medical Center, Chicago, IL: Dr. James Edward Eckenhoff (1915-96) was a major author, teacher, and leader in American anesthesiology. His career began at the University of Pennsylvania in 1945 after he witnessed the need for trained anesthesiologists on the battlefield in World War II. He rose to Professor and Vice-Chairman at Pennsylvania and left in 1966 to create and chair the Department of Anesthesiology at Northwestern University. In 1970, he was appointed Dean of the Medical School, a position he held until 1983. He remained very active in academic anesthesiology and was a Director (1965-73) and President (1973) of the American Board of Anesthesiology. He authored or edited seven books and over 120 articles. Introduction to Anesthesia, one of his textbooks, continues to be among the finest introductory texts. By all accounts, Eckenhoff was a scholarly, quiet, courteous, and beloved physician.

Junior examiner: **Paul M. Wood, M.D.**, Founder, Wood Library-Museum of the American Society of Anesthesiology, Chicago, IL: Paul Meyer Wood, M.D., (1894-1963) was a busy and very productive anesthesiologist who distinguished himself for his interest in the roots of our specialty. He was an active staff member in 20 hospitals and a consultant in 20 more. He was secretary of the New York Society of Anesthesiologists from 1930-44, which became the American Society of Anesthesiologists in 1945. He was a founding member of the American Board of Anesthesiology, its Secretary-Treasurer from 1937-38, and its President in 1948. He was the business manager of Anesthesiology from its inception in 1939 to 1944. He received the distinguished service award from the American Society of Anesthesiologists in 1945. He was the founder and curator of the Wood Library-Museum of the American Society of Anesthesiologists. Paul Wood was born in Frankfort, Indiana, where his father was a school teacher. He graduated from South Bend High School and entered Notre Dame but finished his B.S. at Columbia in 1917. He started medical school at Columbia but left to command an ambulance unit in Italy in WW I. He returned to finish medical school after winning several medals for valor and graduated in 1922. He spent two years at Roosevelt Hospital where he was trained in anesthesia by Thomas Buchanan and James Gwathmey. He became Junior Attending Anesthetist at Roosevelt in 1925. In his late 30s, he was stricken with what was believed to be coronary thrombosis and during his recovery conceived of a permanent library for anesthesia. The library grew steadily under his care and after several moves became the Wood Library-Museum of Anesthesiology, sponsored by the American Society of Anesthesiologists. (Betcher, Albert. *Anesthesiology*, 24: 5, 612-14)

Examinee: Niels F. Jensen, Commander, Elite Ranger Board Force

Location: Tampa, Florida. The Marriott Westshore.

**A. Preoperative Evaluation**

**1. Pulmonary function:**

1. Induction:

JE: Would you induce with thiopental? Why/Why not?

NFJ: Assuming the workup has demonstrated that he could survive a pneumonectomy thiopental is a reasonable choice for the induction, especially in reduced dose. It does result in myocardial depression but the EF is low normal. The patient would likely tolerate a reduced dose.

JE: Propofol? What is your choice? Why?

NFJ: Propofol is not as good a choice, in my view, given its greater propensity to cause hypotension.

JE: The surgeon requests a double-lumen tube. How do you respond?

NFJ: It's certainly a reasonable request and I would honor it.

JE: How do you confirm its position?

NFJ: By listening and by inspection with a fiberoptic bronchoscope.

JE: Is a right-sided tube appropriate? Why/Why not?

NFJ: A right double lumen is not contraindicated, especially given left sided surgery but I would still place a left double lumen. The takeoff of the right upper lobe bronchus is closer to the carina. This makes a left double lumen more desirable.

## 2. Anesthetic Selection:

JE: Is nitrous oxide-opioid anesthesia appropriate? Why/Why not?

NFJ: No, I would use air rather than nitrous oxide to avoid unnecessary lung expansion and opioids should be used but not as a sole anesthetic. This could lead to patient recall and difficulty with extubation.

JE: What is your choice? Why?

NFJ: Air, oxygen, fentanyl, and isoflurane.

JE: Would halothane be preferable if the patient has reactive airway disease?

NFJ: No, not necessarily. The key in reactive airway disease is to avoid stimulation. Isoflurane is a reasonably good bronchodilator. . .

JE: But is halothane better, that's the question?

NFJ: Halothane is a reasonable choice but. . .

JE: Then why wouldn't you use it?

NFJ: Isoflurane has a lower blood/gas partition coefficient and quicker onset and offset times. We may decide to extubate this patient as soon as possible following surgery and isoflurane would offer an advantage in this respect.

JE: Would you prefer another inhalation agent in this patient? Why?

NFJ: I don't see a clear reason to use the more expensive agents, sevoflurane or desflurane, in this case.

JE: I thought you wanted earlier extubation, you're sounding a little inconsistent.

NFJ: Obviously, one is trying to balance several issues.

## 3. Intra-operative Hypoxia:

JE: After 20 minutes of one-lung ventilation, SpO<sub>2</sub> is decreased from 99% to 90%. What is your interpretation and response?

NFJ: If the change is gradual it's probably due to shunting and poor pulmonary reserve. If it's a rapid change, it may relate to a more serious problem such as extubation, herniation of the bronchial cuff, or some related difficulty.

JE: Explain your rationale for therapeutic choices.

NFJ: Assuming the problem was more gradual in its development, I would assume it was related to shunting and would begin CPAP at about 5 cm H<sub>2</sub>O. This would probably bring the saturation up into the mid-90s.

JE: What if SpO<sub>2</sub> is 80%?

NFJ: At a saturation of 80%, the situation is obviously much more threatening. I would inform the surgeon and immediately reinflate the down lung. The issue of tube dislodgment is also more important.

## 4. Massive Blood Loss:

JE: The surgeon loses control of the pulmonary vein and the patient loses 1200 ml blood in two minutes. Two units of packed cells are available. How would you manage? Why?

NFJ: I would immediately hang blood. This is a very threatening situation, obviously. I would also urgently request the circulating nurse to call for more blood. This may turn into a full court press.

JE: Keep your sports metaphors to yourself!

NFJ: Yes, sir.

JE: Blood pressure is not responding to volume replacement. What is your plan? Explain your rationale.

NFJ: The plan is to administer blood and crystalloid as rapidly as possible. The cordice I placed before surgery is a 12 gauge catheter so I should be able to push blood and fluids rapidly. I would also temporize with neosynephrine, turn off isoflurane, and switch to 100% oxygen.

JE: Ischemia is detected on the ECG. How does it influence your management? What is your plan? Why?

NFJ: The best approach is probably to determine the cause of the ischemia. Vital signs are critical. If the cause is hypotension from bleeding, blood pressure needs to be supported in the manner outlined. If the cause is tachycardia, rate needs to be slowed. If the saturation is low, it needs to be addressed. Treatment really depends upon the cause.

#### **POST-OPERATIVE CARE-8:40 A.M.**

##### 1. Extubation Criteria:

PW: How will you decide the suitability for extubation? Explain your rationale.

NFJ: Extubation criteria need to be met. Extubation following thoracotomy

PW: How does this criteria for this patient differ from an ASA-1 cholecystectomy patient? Explain.

NFJ: Significantly. He has significant underlying pulmonary dysfunction, the operation involves his chest wall,

##### 2. Post-Operative Ventilatory Support:

PW: Assume an ABG at the end of surgery with a double-lumen ET tube and bilateral ventilation shows the following: PaO<sub>2</sub> 65, PaCO<sub>2</sub> 58, pH 7.29 with F<sub>I</sub>O<sub>2</sub> .5 and spontaneous ventilation. Interpret the blood gas.

NFJ: The pH reveals an acidemia, the respiratory status is a respiratory acidosis, and the patient is hypoxic on a FiO<sub>2</sub> of 50%. The patient is probably so hypoxic because of V/Q mismatching and intrapulmonary shunting. The retention of carbon dioxide is also evidence of severe intrapulmonary shunting. I would not extubate with these numbers and what they suggest.

PW: How will you proceed? Why?

NFJ: The double lumen tube needs to be changed in the operating room prior to transport to the intensive care unit.

PW: Discuss ventilatory settings. Discuss IMV vs. PCV. Discuss PEEP.

NFJ: I would begin pressure controlled ventilation, in the assist control mode to begin with. I would start with something like a rate of 10, TV 10cc/kg, and PEEP of 5 and obtain an arterial blood gas after a few minutes have elapsed.

##### 3. Pain Management:

PW: Would PCA be a good choice? Why/Why not?

NFJ: It an acceptable choice but is probably not as effective as epidural narcotics. Epidural narcotics would provide better pain control, less splinting, better pulmonary mechanics, and improved oxygenation.

PW: Is a thoracic epidural a better choice? Why/Why not?

NFJ: Yes, it's a better option.

PW: If an epidural in placed, what medications would you administer? Why?

NFJ: Demerol and bupivacaine is an effective choice.

#### 4. Myocardial Ischemia:

PW: 8 hours after surgery the patient complains of anterior chest pain and you note new S-T segment elevation on the bedside monitor. How will you proceed? Why?

NFJ: I would check vital signs, order a 12 lead EKG and compare it to the previous EKG, obtain an arterial blood gas, and control factors impacting myocardial oxygen consumption—increased preload, afterload, and rate. If vital signs permit, nitroglycerin is indicated. I'd also consult cardiology.

PW: 30 minutes later, his blood pressure is 80/30 and you note tachypnea and diffuse rales. Discuss evaluation and management.

NFJ: The vital signs and symptoms suggest congestive heart failure. The patient needs a PA catheter to optimize filling pressures, cardiac output, and SVR.

#### 5. Nerve Injury:

PW: Following extubation and at the time of discharge from the ICU, the patient complains of numbness over the ulnar distribution of his right forearm and hand. What might be the cause(s)? How will you evaluate?

NFJ: The most likely diagnosis is probably neuropraxia of the ulnar nerve secondary to positioning of the extremity.

PW: Is there any treatment for this?

NFJ: Time is probably the best treatment. I don't practice very much pain management. . .

PW: What does that have to do with it?

NFJ: This is an apparent nerve injury and before I dealt definitively with the situation I would talk to one of my pain management experts. I am not aware of an specific therapies to rapidly reverse the process. Time is probably the best cure.

PW: What will you tell the patient—who is quite upset?

NFJ: I would go to the bedside and educate the patient about the nature of the problem. I would show him the ulnar nerve distribution and explain how I had padded his extremity to avoid this complication but somehow it occurred. I would remind him that I had informed him of this possibility in my preop visit, express regret, and tell him I think it will improve with time. I would give him a telephone number where I can be reached if he has subsequent questions and get his telephone number to call and check upon him in a couple of weeks.

#### 6. Jaundice:

PW: 4 days after surgery, the patient's bilirubin is 6.5 mg/dl. The surgeon questions if anesthesia might be the cause. How do you respond?

NFJ: Anesthesia could be the cause, but it's not likely. It's a prehepatic, hepatic, or posthepatic cause. On the prehepatic side is hemolysis, on the hepatic side hepatitis, and on the post-hepatic side obstruction of the common bile duct. We need more information to get to determine the cause of the problem.

PW: Discuss further evaluation.

NFJ: A plasma free hemoglobin may help determine the presence of hemolysis. Liver function tests may help determine the presence of hepatitis. Radiographic studies may help detect the presence of acute cholecystitis.

#### **ADDITIONAL TOPICS-8:55 a.m.**

1. Obstetrical Anesthesia: Pre-eclampsia:

JE: Urgent C/S for fetal distress is scheduled for a 19 year old parturient who is pre-eclamptic and in active labor. She is receiving MgSO<sub>4</sub> and intermittent hydralazine. Blood pressure is 150/110. What would be your choice of anesthesia? Why?

NFJ: If I felt she did not have a significant coagulopathy, an epidural would be acceptable.

JE: For an urgent C-section?

NFJ: I'm sorry! I didn't listen well to your question. Obviously, in an urgent situation the best approach would probably be general anesthesia with an IV rapid sequence induction.

JE: Discuss advantages/disadvantages of epidural anesthesia. How would you control blood pressure?

NFJ: Lidocaine, fentanyl, esmolol and in-line sodium nitroprusside would provide reasonable blood pressure control.

JE: Why? What are your goals? Explain.

NFJ: My goals are hemodynamic stability in the setting of a full stomach.

2. Post-CABG tamponade:

JE: A 65 year old man underwent an uncomplicated CABG 16 hours earlier and was extubated 4 hours ago. In the past hour his BP fell from 110/70 to 70/50 and the CVP rose from 8 to 22 mmHg. What are the possible etiologies?

NFJ: Heart failure or myocardial tamponade are the two most likely etiologies. I would check the PA pressure and the wedge. If there seems to be equalization of diastolic filling pressures across the heart, cardiac tamponade is likely.

JE: If tamponade is suspected and mediastinal exploration is required, how would you provide anesthesia? Explain.

NFJ: Hemodynamic goals include keeping the patient "full, fast, and tight." Sometimes cardiac compromise can be so significant that awake pericardiocentesis is indicated. If general anesthesia is undertaken, ketamine is an excellent induction agent—meeting the goals specified.

3. Temperature:

JE: A 48 year old man is undergoing a radical prostatectomy during general anesthesia. Two hours into the operation, his esophageal temperature is 34.5 C. What is your management?

NFJ: To warm the patient. IV solutions need to be warmed, the room temperature increased, and a Baer Hugger placed. I would also warm inspired gases.

JE: The surgeon says he is already hot and wonders why didn't you do a better job of defending the patient's temperature at the beginning of surgery. Why should he have to suffer for your mistakes?

NFJ: I would have acted sooner. The best time to preserve body temperature is at the beginning of the case, preemptively before the problem becomes significant. That's what I would have done here. But if the patient did become hypothermic, we have to forget about what could

have been done and deal with the problem. That's what I would tell the surgeon and that's what I'd do.

JE: The surgeon attributes a problem with bleeding to the hypothermia. Do you agree? Why/Why not?

NFJ: No, not usually at 34.5 degrees centigrade. Platelet sequestration and even dysfunction occur with hypothermia but not usually until the temperature reaches about 28 degrees centigrade. I would check a platelet count and obtain a PT and PTT.

JE: What does PT measure?

NFJ: The extrinsic side of the clotting pathway.

JE: Which factors?

NFJ: As I recall, the extrinsic pathway involves factors 3, 7, and 4.

JE: What might be the mechanism for hypothermia causing bleeding and how will temperature influence your plans for extubation? Describe.

NFJ: As I said, I believe the mechanism is platelet dysfunction. The patient needs to be warmed before extubation. A shivering patient with a high oxygen consumption is not desirable from either an aesthetic or physiologic point of view.

JE: Dr. Jensen, could you please define the word aesthetic?

NFJ: I'll try. . .

Knock at door

**This is War. Let's Win!**

Don't Quit

When things go wrong, as they sometimes will,  
When the road you're trudging seems all uphill,  
When funds are low, and debts are high,  
And you want to smile, but you have to sigh,  
When care is pressing you down a bit,  
Rest if you must, but don't quit

Life is queer with its twists and turns,  
As everyone sometimes learns,  
And many a failure turns about,  
When she might have won had she stuck it out;  
Don't give up though the pace seems slow,  
You may succeed with another blow.

Success is failure turned inside out,  
The silver tint of the clouds of doubt,  
And you never can tell how close you are.  
It may be near when it seems so far;  
So stick to the fight when you're hardest hit,  
It's when things seem worse,  
That you must not quit.