Online Data Supplement

Impact of a Multimodal Simulation-based Curriculum on Endobronchial Ultrasound Skills

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Name: _____   **PGY 4 5 6 7**   **Date:**_____

Multiple Choice Questions - EBUS curriculum

Please answer the following multiple-choice questions. There is a "single" best answer for each question. Your target score is 100% correct responses

Question 1: Which of the following causes of mediastinal adenopathy is EBUS-TBNA least effective to diagnose?

A. Primary lung cancer
B. Metastatic breast cancer
C. Sarcoidosis
D. Lymphoma

Question 2: A 45-year-old actively smoking man was noted to have peripheral 3 cm right lung mass and mediastinal lymphadenopathy (station 4R, 7) concerning for cancer. To obtain diagnosis and provide enough specimens for molecular analysis, you should:

A. Thoracic surgery referral for mediastinoscopy for sampling lymph nodes.
B. Proceed with EBUS-TBNA to obtain the at cytology specimens for molecular analysis.
C. Tell the oncologist that there is no role for such testing.
D. Interventional radiology consult for perform a CT –guided biopsy from the lung mass.

Question 3: For a patient who needs EBUS-TBNA sampling of lymph node station 2R, which of the following anesthesia methods would you employ

A. General anesthesia with endotracheal intubation.
B. General anesthesia with laryngeal mask airway.
C. Moderate sedation.
D. Local laryngotracheal analgesia.
E. Either B or C

Question 4: Which of the following sonographic characteristics is the most specific for a metastatic lymph node?

A. Its heterogeneous echogenicity
B. Size of 1.5 cm
C. The hypoechoic areas within the lymph node without blood flow
D. Its distinct margins

Question 5: While performing EBUS-TBNA, you notice the following image on the display monitor. What has happened?

A. You rotated your wrist and now you are imaging a blood vessel.
B. The lymph node is not in the scanning plane and you are imaging the normal lung
C. The balloon is not in intimate contact with the airway wall.
D. Nothing has happened; this is the normal pattern of a lymph node.

Question 6: While performing EBUS-TBNA you notice the hyperechoic structure distal to the node in the figure shown below (see arrows). This represents:

A. Air bronchogram.
B. Tadpole tail sign.
C. Acoustic shadow artifact.
D. Comet tail artifact.
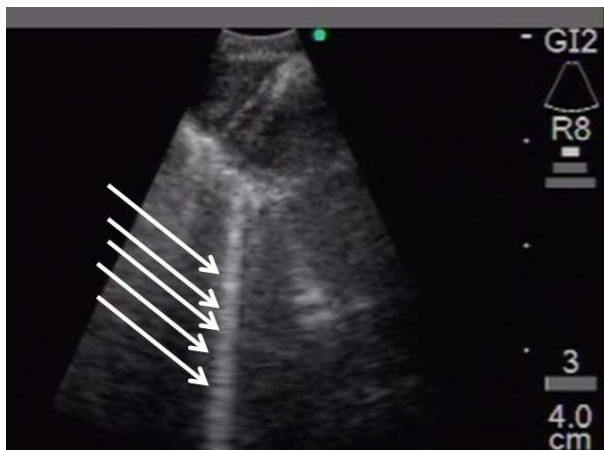
Question 7: Representative cytology specimens are best obtained by:

A. Aspirating from the center of the lymph node
B. Noting more than 10% cellularity composed of lymphocytes
C. Repeated aspiration attempts until a tissue core is obtained

D. Aspirating from the periphery of the lymph node

Question 8: While performing EBUS-TBNA from a lymph node station 4L, you obtain a bloody aspirate. This is most likely because:

A. The right pulmonary artery has been penetrated.
B. The aorta has been penetrated.
C. The left pulmonary artery has been penetrated
D. A blood vessel within the lymph node itself has been penetrated

Question 9: After two aspirates from lymph node station 4L in a patient with suspected lung cancer, the on-site cytologist tells you that the cytology stain shows scant lymphocytes and benign bronchial cells. You should:

A. Continue the procedure and perform another one or two aspirates.
B. Abort the procedure and wait for the final results.
C. Abort the procedure since the specimen shows lymphocytes.
D. Continue the procedure until a diagnosis is obtained.

Question 10: Which of the following EBUS-TBNA related complications has the greatest impact on patient management?

A. Inability to sample a level 7 node because of scope breakage during the procedure
B. False negative sampling of a contralateral paratracheal node
C. False negative sampling of an ipsilateral level 10 node
D. Inability to penetrate through the lymph node capsule

Question 11: During an EBUS-TBNA staging procedure in a patient with a right upper lobe mass and lymphadenopathy at level 10R, 7, 4R and 4L, you initially start by sampling which of the following nodes?

A. Station 10R
B. Station 7
C. Station 4L
D. Station 4R

Question 12: This EBUS image is obtained while imaging the left lower paratracheal lymph node station. Which of the four structures labeled A, B, C or D represents the pulmonary artery?

  A. A
  B. B
  C. C
  D. D
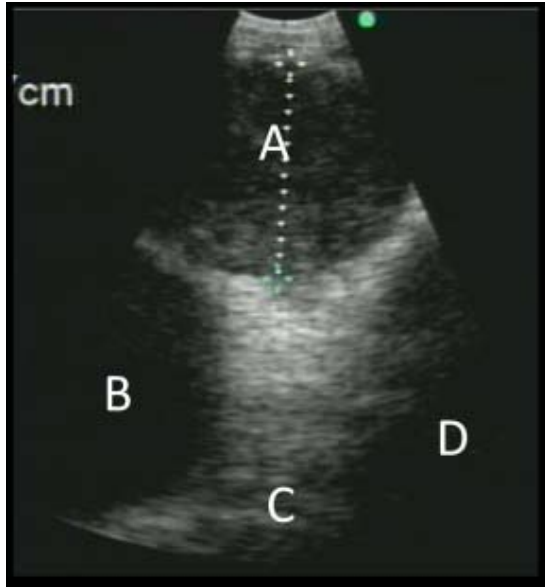
Question 13: With the EBUS scope placed just proximal to the main carina and turned towards the 9-o'clock position, the visualized lymph node likely represents:

A. Station 4L
B. Station 10L
C. Station 2L
D. Station 7

Question 14: With the EBUS scope in the proximal bronchus intermedius and with the transducer pointed towards the right lateral wall, the lymph node station likely represents:

A. Lymph node station 10R
B. Lymph node station 11R superior
C. Lymph node station 11R inferior
D. Lymph node station 12 R

Question 15: While performing EBUS-TBNA, after the needle system is secured on the scope by sliding the flange, your next step should be:

A. Release the needle screw
B. Release the sheath screw
C. Agitate the stylet several times in and out of the needle-sheath
D. Advance the sheath until it touches the airway wall

Question 16: While performing EBUS-TBNA, once the needle is visualized inside the node, the next thing you do is to:

A. Remove the stylet and attach the syringe
B. Move the stylet in and out a few times
C. Pass the needle in and out 10-15 times
D. Apply suction with approximately negative 20 ml of air

Question 17: In a patient with right upper lobe adenocarcinoma requiring mediastinal staging, which of the following nodal stations should be sampled first?

A. The enlarged, but PET negative contralateral lower paratracheal node
B. The enlarged but PET negative subcarinal node
C. The enlarged ipsilateral PET positive hilar node
D. The enlarged ipsilateral PET positive lower paratracheal node

Question 18: For a patient with a 4cm left upper lobe mass confirmed as adenocarcinoma by CT guided FNA, and a 2-cm left lower paratracheal lymph node seen on computed tomography, the best diagnostic yield for staging prior to thoracotomy is offered by:

A. Esophageal ultrasound-guided fine needle aspiration (EUS) alone
B. Endobronchial ultrasound –guided transbronchial needle aspiration (EBUS) alone
C. Mediastinoscopy
D. Combined EUS and EBUS followed by Mediastinoscopy

Question 19: A 55-year-old patient with 25 pack-year history of smoking was found to have a 2 cm right upper lobe nodule and mediastinal lymphadenopathy. EBUS-TBNA from the right (4R) and left (4L) lower paratracheal lymph nodes showed reactive lymphocytes but no malignancy. The next step is to:

A. Proceed with EUS to repeat biopsy from station 4L.
B. Perform mediastinoscopy.
C. Proceed with thoracotomy with nodal dissection.
D. Refer to oncology for multimodality treatment for stage III B lung cancer.

Question 20: A 70-year-old patient with a right upper lobe mass underwent a PET-CT which showed a PET positive level 11R and PET negative level 7 lymph nodes. The first thing you should do during EBUS is:

A. Sample station 7 since the diagnostic yield is higher than from station 11R
B. Sample station 11R since it's PET positive
C. Evaluate and sample left sided mediastinal lymph nodes, if present
D. Evaluate and sample any pre-carinal lymph nodes, if present

Feedback: (please circle one)

a) How hard were the questions? (1-very easy, 2-easy, 3-moderate, 4- difficult, 5-very difficult)

1   2   3   4   5

b) Any other feedback?

_____

_____

_____

_____

_____

_____

_____

Name:

Date:

EBUS Self-Assessment Tool

The purpose of this assessment tool is to provide bidirectional feedback between learner and instructor. There are no wrong answers.

Please answer each question by writing the number that most closely represents their experience with EBUS and EBUS-TBNA using the following scale.

1	2	3	4	5
Not comfortable		Comfortable		Very comfortable

1. I am able to introduce the EBUS bronchoscope without difficulty ____
2. I am able to atraumatically maneuver the EBUS bronchoscope ____
3. I am able to identify major mediastinal vascular structures ____
4. I am able to identify lymph node stations 2R and 2L ____
5. I am able to identify lymph node stations 4R and 10R, 7 and 4L ____
6. I am able to identify lymph node stations 10L and 11L, 11Rs and 11Ri ____
7. I am able to use gain, depth and Doppler functions ____
8. I am able to recognize ultrasound image distortions/artifacts ____
9. I am able to obtain to obtain an adequate EBUS-TBNA sample ____
10. I am comfortable independently performing EBUS-TBNA in patients ____

Anatomy   Abnormalities   Technique   Equipment   Interpretation of findings

I would like to learn more about (circle all that apply above)

Modified EBUS-STAT for Bronch Express Simulator
(Endo Bronchial Ultrasound -Skills and Tasks Assessment Tool)

Learner: _____ Year of Training _____

Proctor _____ Date _____

EBUS TBNA done by learner   0   1-5   5-10   10-20   20-40   >40

Completed Bronch SIM Didactic lectures   Y / N
Completed Bronch SIM Hands on Task 1,2,3   Y / N
Completed Bronch SIM Hands on Task 4   Y / N
Completed Bronch SIM EBUS modules   Y / N

Knowledge Skills on Simulator	
1. Image analysis: CT scans (1 point each, target 10 points) □ Image 1 □ Image 2 □ Image 3 □ Image 4□ Image 5 □ Image 6 □ Image 7□ Image 8 □ Image 9 □ Image 10	Score ___/10
2. Image analysis: EBUS views (1 point each, target 10 points) □ Image 1 □ Image 2 □ Image 3 □ Image 4□ Image 5 □ Image 6 □ Image 7 □ Image 8 □ Image 9 □ Image 10	Score ___/10
3. Decision-making tasks: (1 point each, target 5 points) □ Image 1 □ Image 2 □ Image 3 □ Image 4 □ Image 5	Score ___/5

SCORE ___/25

Modified EBUS-STAT, EBUS-TBNA simulation scenario and scoring sheet

Technical Skills on Simulator			Score
4. Systematic lymph node station identification (2 points per item) ☐ 2L ☐ 2R ☐ 4L ☐ 4R ☐ 7 ☐ 10R ☐ 10L ☐ 11Rs ☐ 11L ☐ 11Ri			Score ___/20
5. Identify major mediastinal vascular structures (4 points per item) ☐ Aorta ☐ Pulmonary artery ☐ Superior vena cava ☐ Azygos vein ☐ Left atrium			Score ___/20
6. Performance of EBUS-TBNA (2 points each, target 20 steps)			Score ___/40

1☐ Verify needle is drawn up until click lock is felt **and** ensure needle position is locked	8☐ Advance needle into target using jab movement	15☐ Release suction
2☐ Verify ultrasound image screen is functional before starting procedure	9☐ Visualize needle within target lesion	16☐ Confirm that balloon is deflated
3☐ With scope in neutral position, advance needle tool through working channel of bronchoscope	10☐ Move stylet in and out a few times	17☐ Keep scope in neutral position
4☐ Secure needle housing by sliding the flange	11☐ Remove stylet	18☐ Retract needle into sheath until click **and** lock needle position
5☐ Release sheath screw, advance sheath **and** lock it when it touches the wall (or check sheath is in position)	12☐ Attach syringe	19☐ Slide the flange to unlock and remove the needle housing through working channel
6☐ Check doppler on needle path; Can use balloon if needed	13☐ Apply suction	20☐ Check if balloon is intact
7☐ Release needle safety click lock	14☐ Pass needle in and out of target at least 15 times	

7. Scope damage could have occurred? **Y / N**	

SCORE ___/80

Modified EBUS-STAT, EBUS-TBNA simulation scenario and scoring sheet

PASS 1

1☐ Verify needle is drawn up until click lock is felt **and** ensure needle position is locked	8☐ Advance needle into the target using jab movement	15☐ Release suction
2☐ Verify ultrasound image screen is functional before starting procedure	9☐ Visualize needle within the target lesion	16☐ Confirm that balloon is deflated
3☐ With scope in a neutral position, advance needle tool through the working channel of the bronchoscope	10☐ Move stylet in and out a few times	17☐ Keep scope in a neutral position
4☐ Secure needle housing by sliding the flange	11☐ Remove stylet	18☐ Retract needle into sheath until click **and** lock needle position
5☐ Release sheath screw, advance sheath **and** lock it when it touches the wall (or check sheath is in position)	12☐ Attach syringe	19☐ Slide the flange to unlock and remove the needle housing through working channel
6☐ Check doppler on needle path; Can use balloon if needed	13☐ Apply suction	20☐ Check if the balloon is intact
7☐ Release needle safety click lock	14☐ Pass needle in and out of the target at least 15 times	

PASS 2

1☐ Verify needle is drawn up until click lock is felt **and** ensure needle position is locked	8☐ Advance needle into the target using jab movement	15☐ Release suction
2☐ Verify ultrasound image screen is functional before starting procedure	9☐ Visualize needle within the target lesion	16☐ Confirm that balloon is deflated
3☐ With scope in a neutral position, advance needle tool through the working channel of the bronchoscope	10☐ Move stylet in and out a few times	17☐ Keep scope in a neutral position
4☐ Secure needle housing by sliding the flange	11☐ Remove stylet	18☐ Retract needle into sheath until click **and** lock needle position
5☐ Release sheath screw, advance sheath **and** lock it when it touches the wall (or check sheath is in position)	12☐ Attach syringe	19☐ Slide the flange to unlock and remove the needle housing through working channel
6☐ Check doppler on needle path; Can use balloon if needed	13☐ Apply suction	20☐ Check if the balloon is intact
7☐ Release needle safety click lock	14☐ Pass needle in and out of the target at least 15 times	

PASS 3

1☐ Verify needle is drawn up until click lock is felt **and** ensure needle position is locked	8☐ Advance needle into the target using jab movement	15☐ Release suction
2☐ Verify ultrasound image screen is functional before starting procedure	9☐ Visualize needle within the target lesion	16☐ Confirm that balloon is deflated
3☐ With scope in a neutral position, advance needle tool through the working channel of the bronchoscope	10☐ Move stylet in and out a few times	17☐ Keep scope in a neutral position
4☐ Secure needle housing by sliding the flange	11☐ Remove stylet	18☐ Retract needle into sheath until click **and** lock needle position
5☐ Release sheath screw, advance sheath **and** lock it when it touches the wall (or check sheath is in position)	12☐ Attach syringe	19☐ Slide the flange to unlock and remove the needle housing through working channel
6☐ Check doppler on needle path; Can use balloon if needed	13☐ Apply suction	20☐ Check if the balloon is intact
7☐ Release needle safety click lock	14☐ Pass needle in and out of the target at least 15 times	

For Trainee

ITEM 1 : Match the photo (A-L) to the corresponding 10 CT scan descriptions (Only one response per description)			
_____ Superior vena cava adjacent to 4R	_____ Inominate vein adjacent to 2R	_____ Pulmonary artery adjacent to 4L	_____ Aortic arch adjacent to 4L
_____ Azygos vein adjacent to 4R	_____ Station 7 adjacent to left atrium	_____ Station 11L with adjacent lung	_____ Station 10R
_____ Station 4L in axial view	_____ Pulmonary artery adjacent to 10L	NO RESPONSE	

ITEM 2 : Match the photo (A-L) to the corresponding 10 EBUS views (Only one response per description)			
_____ Station 4R adjacent to pulmonary artery superior vena cava and ascending aorta	_____ Needle penetrating through and through	_____ Needle missing target node	_____ Station 4L adjacent to aorta and pulmonary artery
_____ Station 4L adjacent to pulmonary artery	_____ Needle within lymph node	_____ Normal lung	_____ Reverberation artifact
_____ Station 7 adjacent to left atrium	_____ Hilar node adjacent to normal lung	NO RESPONSE	

ITEM 3:

Choose one best answer for each question:

a) Three FDG avid nodes are noted on Fusion PET-CT in a patient with a Left Upper Lobe PET positive mass. Which node (X, Y or Z) should be sampled first?

Answer _____

b) During bronchoscopy, where is this node located (needle insertion site A, B, C, D, E, F, G, or H)?

Answer _____

Choose one best answer for each question:

c) To sample station 11L, where would you point the EBUS scope towards- (A), (B) or (C)?

Answer _____

d) When sampling level 4R, where would you point the EBUS scope towards- (A), (B) or (C)?

Answer _____

e) With the EBUS scope is placed as shown, the interlobar Pulmonary Artery is most likely seen when sampling which of the following lymph node station?
    (A) 10R
    (B) 11R
    (C) 12R

Answer _____

Modified EBUS-STAT, EBUS-TBNA simulation scenario and scoring sheet

EBUS-TBNA simulation scenario (Instructor Manual)

Welcome to EBUS-TBNA simulation training session. Today we will be assessing your knowledge of lymph node stations, surrounding anatomy and TBNA technical skills during EBUS using a high-fidelity simulator. I will be taking you through the modules, assisting with the simulator and your proctor.

We will start by describing our **set up**: This session is conducted using a high-fidelity bronchoscopy simulation system. It is connected to our manikin/simulation body unit and we will use it to with a laptop to simulate findings during EBUS-TBNA. The **simulation bronchoscope** has the following parts (show the trainee) - endobronchial ultrasound at the tip and bronchoscope working channel. We understand that some things cannot be simulated. For this session to work you need to suspend your notion of disbelief and assume you are with a real patient in real life. This session is divided into 4 phases. First phase is image-based knowledge assessment and other 3 phases are technical skills assessment.

(During testing, do not give feedback about correct/incorrect items in any of these modules to the trainee. The purpose of these modules is to assess trainee's baseline knowledge and skills only).

Phase	Instructor steps	To be read by instructor to the trainee
1	Start the module "Item 1"	In the first phase, we will assess your **knowledge skills** about image recognition. You have a total of 20 min to complete this Phase (includes Item 1-3). This module has 12 CT images with 10 description tiles. Please match the description tile to the structure pointed by the arrow on the image. Two images will go unmatched.
	After completing Item 1, Start the module named "Item 2". Point out the caliper measurements in image C, E.	This module has 12 EBUS images with 10 description tiles. Please match the description tile to the structure pointed by the arrow on the image. Two images will go unmatched.
	On completion, Start the module "Item 3a&b". On completion, Start the module "Item 3c".	Choose the best answer based on the image and question provided.
	On completion, Start the module "Item 3d".	Choose the best answer based on the image and question provided.
	On completion, Start the module "Item 3e".	Choose the best answer based on the image and question provided.
		Choose the best answer based on the image and question provided.
2	Click Task 4 – Anatomy: Lymph nodes. Read	In this module, multiple lymph node stations are marked with an arrow. Your objective is to correctly verbalize the following **lymph node stations** on your first attempt (station 2R, 2L, 4R,

	instruction posted on the module. Can skip station 1R,1L, 12R,12L,13R,13L. Once the trainee has completed, Remove the bronchoscope from the manikin, exit the session, press "save session" when prompted.	4L, 7, 10R, 10L, 11Rs, 11Ri, 11L). Note that there may be multiple lymph node locations for each station. Your view would simulate a regular white light bronchoscope for this module. Your session starts by introducing the scope into the manikin, it will directly take you beyond the vocal cords on insertion
3	Start the module "Case 4". Case details need not be read for this module. Once a trainee has completed, Remove the bronchoscope from the manikin, exit the session and press "save session" when prompted If >1 attempt made to identify the same structure, move on to the next structure.	In this module, you will be assessed on the identification of **major vascular structures** visualized around lymph node stations seen during EBUS. Your objective is to correctly identify the following 5 vascular structures on <u>your first attempt</u> at any location -aorta, pulmonary artery, superior vena cava, azygos vein, and left atrium. Your session starts by introducing the scope into the manikin, it will directly take you beyond the vocal cords on insertion. This patient is getting EBUS under conscious sedation and is not intubated. Your view would simulate an EBUS scope for this module. This patient will have some abnormal lymphadenopathy noted.
4	Start the module "Case 4". Read the case description to the trainee. Hand the tool to the trainee <u>with the needle advanced completely down the scope.</u> Once the trainee has completed, Remove the bronchoscope from the manikin, exit the session, and press "save session" when prompted.	In this module, you will be assessed on the **TBNA technique** with an EBUS scope. **The tool** consists of a removable adaptor, needle housing, sheath and consider this cable at the top as your stylet. On introducing the scope into the manikin, you will be able to use doppler, syringe, suction and balloon per your discretion, as listed on the side panel. The syringe is not included in this simulator equipment, but when you intend to use it, please let us know. We ask you that you share your thought process out loud with every step to get the credit for it. Proceed with the case under the assumption that on-site-cytology is not available at your institution. If there are multiple lymph node stations you wish to perform TBNA, indicate which station you would target first for TBNA. You do not need to perform TBNA on all stations; just do any one station. We want to assess your TBNA skills in that station. You will be assessed on every needle pass. Your session starts by introducing the scope into the manikin. This patient is getting EBUS under conscious sedation and is not intubated. Your view would simulate an EBUS scope for this module.

	If the trainee performs 3 passes at the same station, you can conclude the module. This concludes our session.	

The trainee also completes 20 questions MCQ (total of 15 min) and EBUS-SAT as part of the assessment.

Scoring sheet: Modified EBUS-STAT

Knowledge Skills on Simulator

1. Image analysis: CT scans (1 point each, target 10 points)

The trainee gets 1 point each for every correct image matched to the description tile
The trainee gets 0 points for each description tile that remains unmatched or matched to the incorrect image.

2. Image analysis: EBUS views (1 point each, target 10 points)

The trainee gets 1 point each for every correct image matched to the description tile
The trainee gets 0 points for each description tile that remains unmatched or matched to the incorrect image.

3. Decision-making tasks: (1 point each, target 5 points)

The trainee gets 1 point each for every correct image matched to the description tile
The trainee gets 0 points for each description tile that remains unmatched or matched to the incorrect image.

Procedure Skills on Simulator

4. Systematic lymph node station identification (2 points per item)

The trainee can skip stations not tested (stations 1, 12, 13)
The trainee gets 2 points per lymph node station if correctly identified
-each lymph node station on the first attempt.
-all lymph node locations for the same station
The trainee gets 0 points if either of these criteria is not met

Listed below is the entire list (total 10 stations & total of 14 lymph node locations)
    Station 2R-one location
    Station 2L-one location
    Station 4R-**two** locations
    Station 4L-**two** locations
    Station 7 -**two** locations
    Station 10R-one location
    Station 10L-**two** locations
    Station 11Rs-one location
    Station 11Ri-one location
    Station 11L-one location

5. Identify major mediastinal vascular structures (4 points per item)

The trainee gets 4 points to correctly identify each mediastinal vascular structure on the first attempt.
If there are two vascular structures on the screen/view, ask the trainee what both structures are, so that trainee does not use the labels provided by the simulator (as a clue for the remaining structures) when each item is labeled.

The trainee gets 0 points if the vascular structure is correctly identified on 2nd attempt or after.

6.Performance of EBUS-TBNA (2 points each, target 20 steps)

The trainee gets 2 points for each TBNA step performed in chronological order listed AND if performed in every single needle pass. Monitor trainee's performance in every single needle pass.

Step #9: If needle missed target lymph node or not visualized inside the target node adequately or needle tip advances goes through and through beyond the target, the trainee gets 0 points for step #9. If this happens, trainee has to acknowledge this and perform steps # 17,18 and restart from step #7 again.

The trainee gets credit for a certain step only if performed on all 3 passes (all or none scoring). If the trainee misses a step in ANY single needle pass, the trainee gets 0 points for that step, even if performed in the other two-needle passes. If the trainee performs <3 total needle passes, then grade on the passes performed only.

7. Scope damage could have occurred?   Y / N

Scope damage could have occurred – if <u>ANY</u> of the following steps # 1, 3, 17 or 18 were missed by the trainee

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Test case:

The test case consisted of performance of three EBUS-TBNA needle passes at one lymph node station in one test case on the simulator. Task 4 of the Essential EBUS module in the Simbionix BRONCH Express™ simulator was chosen to assess TBNA technique since it met the objectives of "simple, obvious" mediastinal adenopathy. The test case was a 35-year-old female with mediastinal, hilar, and interlobar adenopathy, clinically consistent with sarcoidosis. The final score for TBNA performance was based on all 3 TBNA passes.

All simulator case modules had been developed by 3D systems.

EBUS Problem-Based learning:

Case # 1:

59-year-old female, active -smoking history (30 pack-year), and COPD presented with a mass on recent CT scan of the thorax showing increase in size of a right lower lobe nodule measuring 1.5 cm, and a new left lower lobe mass measuring 2.3 cm (compared to previous CT one year prior and then lost to follow up). A PET CT scan was done and the following was noted:

1. FDG avid two subcarinal lymph nodes are noted, (SUV max: 7.1 and 5.9). Bilateral hilar lymph nodes are demonstrated, measuring (SUV max 4.7 on the left and 5.1 on the right). (Image A)

2. Mild FDG uptake (SUV max: 2.1) in the spiculated right lower lobe pulmonary nodule in the medial aspect measuring 1.5 x 1.0 cm. (Image B)

3. A spiculated solid 2.3 x 1.8 cm pulmonary nodule in the left lower lobe with hypermetabolic activity (SUV max: 5.1). (Image C)

3. Pulmonary nodules, 1.1 x 0.8 cm in the posterior lateral right lower lobe, and 6 x 6 mm in the left upper lobe, similar to prior CT thorax study, without evidence of increased FDG uptake (Image B).
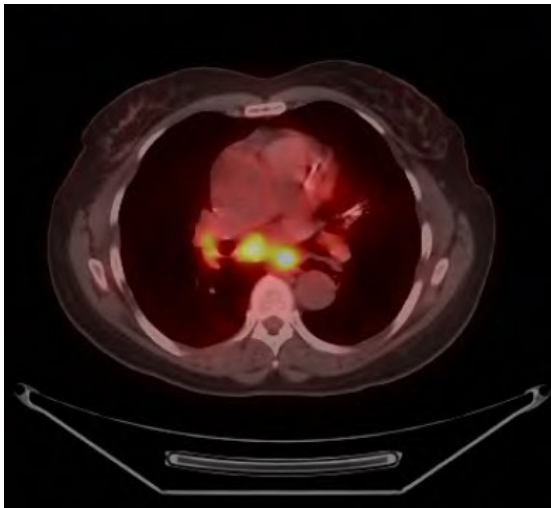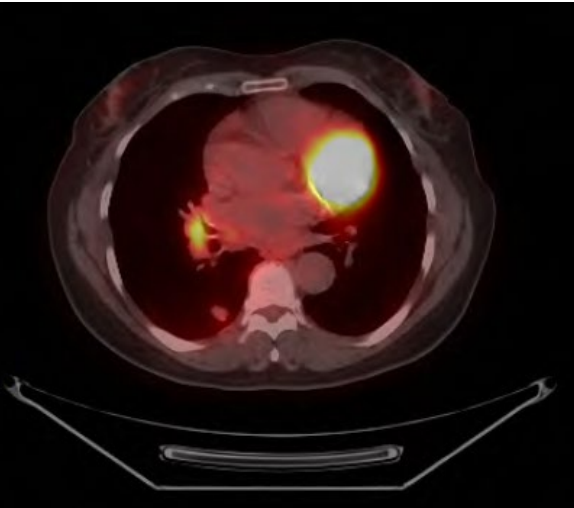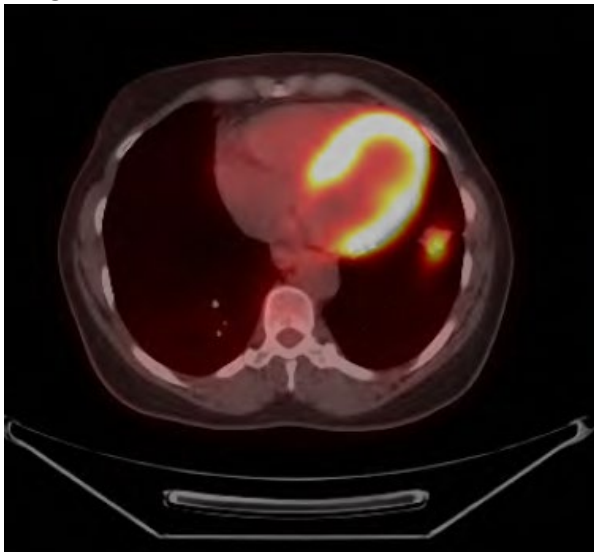
Image A: Image B:

Image C:

QUESTIONS:

1. What would be the best first diagnostic approach for tissue sampling- CT guided biopsy vs EBUS? Why?

2. Based on available evidence which lymph node station would you perform EBUS TBNA first?

3. Patient's underwent a transbronchial needle aspirate (TBNA) and the result showed benign lymphocytes. What is the next step in the management of this patient?

CASE # 2:

55-year-old man has a 1.5 cm solitary pulmonary nodule in the medial-basal segment of right lower lobe which was incidentally noted while he was undergoing CT of the abdomen for nephrolithiasis. A dedicated CT chest shows a 1.5 cm right lower lobe nodule (Image A) and subcarinal lymphadenopathy (Image B), following which PET scan was done showing:

1. Right lower lobe nodule with FDG avidity of 5.5 SUV and
2. 7 mm subcarinal lymph node, which is not PET-avid.

He has no obvious risk factors for cancer (no smoking, history, family history or weight loss). He desires treatment in case of lung cancer if confirmed.

Image A:

QUESTIONS:

1. What is the role/evidence of EBUS staging in PET negative lymphadenopathy?

2. What factors favor/ do not favor EBUS staging in PET negative lymphadenopathy?

3. After performing EBUS-TBNA, what are features of an adequate vs poor TBNA specimen?

Image B: