

# **Endobronchial Ultrasound and EBUS- Guided Needle Aspiration**

Bronchoscopy Education Project

EBUS Assessment Tools



# Scoring Recommendations for EBUS Assessment Tools

The goal of these assessment tools is to be able to monitor a learner's progress along the learning curve from *novice* (Score < 60) to *advanced beginner* (Score 60-79), *intermediate* (score 80-99), and *competent* (score 100). The instructor should be able to ascertain, by observing the learner's performance that each of the elements in the tool are covered satisfactorily. (For EBUS-STAT, this could be done once or twice a year in case of learners participating in a subspecialty training program) Repeated testing will demonstrate increases in knowledge and technical skill acquisition as the learner climbs the learning curve from novice to competent bronchoscopist for the procedure being assessed.

To maximize objective scoring, each task has been defined explicitly. Scores can be plotted on a graph, and each institution or program can choose its own cut-offs for a PASS grade, although we recommend that a final PASS grade be achieved with a score of 100, in order for the learner to be judged competent to perform bronchoscopy independently. This is consistent with a philosophy of master training, useful in competency-oriented training. In the absence of a large pilot study demonstrating standard normograms as is done for high-stakes testing, consensus of world renowned experts was obtained to delineate cut-off scores for the following four categories.

<b>Category</b>	<b>Score</b>
Novice	< 60
Advanced Beginner	60-79
Intermediate	80-99
Competent	100

Specific instructions marked by an asterisk (\*) are provided in each of the assessment tools.

To administer the EBUS-STAT, learners are asked to perform a complete EBUS-TBNA, while at all times stating what they are doing. Thus, items 1 & 2 assess ability to maneuver the EBUS bronchoscope, item 3 & 6 assesses the ability to obtain a satisfactory image and control the image processor, and items 4, 5, and 7 assess the ability to identify targets, mediastinal anatomy, and perform EBUS-TBNA. Items 8 -10 are scored using the associated quiz images. It is not necessary to test for all the items in the same patient, and some of the EBUS-STAT can be performed using a simulator setting.

EBUS-SAT provides an opportunity for bidirectional feedback that can help identify strengths and weaknesses of individual bronchoscopists, but also of the training program. Ideally, learners should complete the EBUS-SAT prior to the session, providing the completed form to their instructor for consideration and feedback.

## EBUS-STAT 10 Point Assessment Tool

Learner: \_\_\_\_\_  
 Faculty \_\_\_\_\_

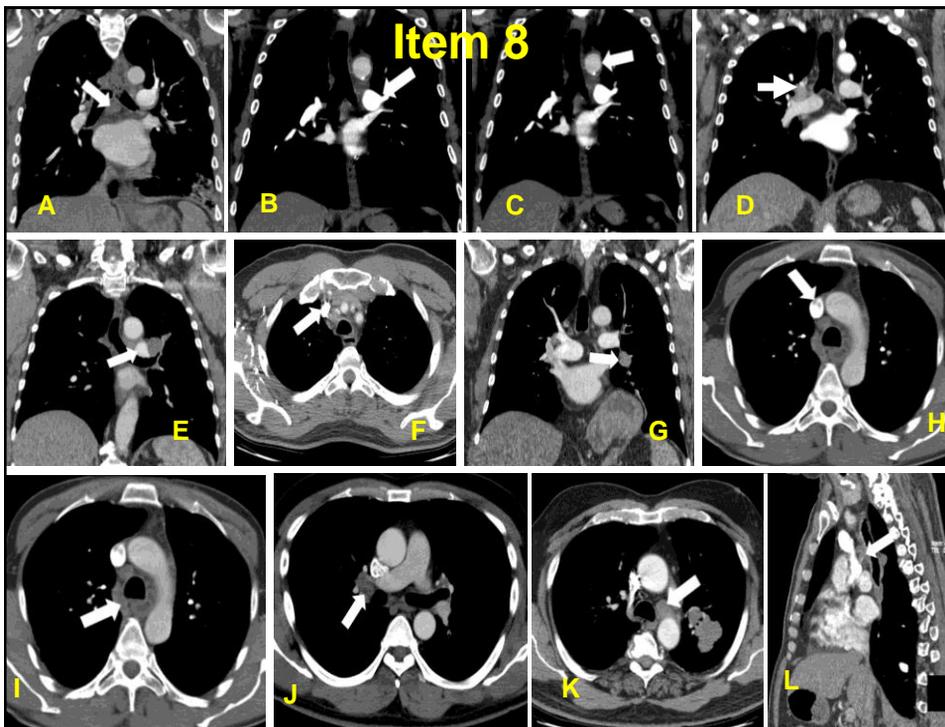
Year of Training \_\_\_\_\_  
 Date \_\_\_\_\_

Educational Item* Items 1-10 each scored separately	Satisfactory Yes/No
<b>1. Able to maneuver the scope through upper airway into trachea, without trauma or difficulty (5 points for single item tested)</b> <input type="checkbox"/> Mouth and Vocal cords <input type="checkbox"/> ET Tube <input type="checkbox"/> Laryngeal mask airway	Yes / No  Score ____/5
<b>2. Able to maneuver scope using white light bronchoscopy within tracheobronchial tree without trauma (4 points, no partial points)</b> <input type="checkbox"/> Scope centered in airway lumen avoiding airway wall trauma	Yes / No  Score ____/4
<b>3. Ultrasound image obtained without artifacts (5 points, no partial points)</b> <input type="checkbox"/> Absence of artifacts on image, any target	Yes / No  Score ____/5
<b>4. Identify major mediastinal vascular structures (4 points per item)</b> <input type="checkbox"/> Aorta <input type="checkbox"/> Pulmonary artery <input type="checkbox"/> Superior vena cava <input type="checkbox"/> Azygos vein <input type="checkbox"/> Left atrium	Yes / No  Score ____/20
<b>5. Identify lymph node station (Select 3 targets, 5 points each)</b> <input type="checkbox"/> 2R <input type="checkbox"/> 2L <input type="checkbox"/> 4R <input type="checkbox"/> 10R <input type="checkbox"/> 7 <input type="checkbox"/> 4L <input type="checkbox"/> 10L <input type="checkbox"/> 11L <input type="checkbox"/> 11Rs <input type="checkbox"/> 11Ri	Yes / No Score ____/15
<b>6. Able to operate EBUS processor (2 points each item)</b> <input type="checkbox"/> Gain <input type="checkbox"/> Depth <input type="checkbox"/> Doppler	Yes / No Score ____/6
<b>7. Performance of EBUS-TBNA (1 point each, target 15 points)</b> <input type="checkbox"/> Advance needle through working channel (neutral position) <input type="checkbox"/> Secure needle housing by sliding the flange <input type="checkbox"/> Release sheath screw <input type="checkbox"/> Advance and lock sheath when it touches wall <input type="checkbox"/> Release needle screw <input type="checkbox"/> Advance needle using jab technique <input type="checkbox"/> Visualize needle entering target node <input type="checkbox"/> Move stylet in and out a few times <input type="checkbox"/> Remove stylet <input type="checkbox"/> Attach syringe <input type="checkbox"/> Apply suction <input type="checkbox"/> Pass needle in and out of node 10-15 times <input type="checkbox"/> Release suction <input type="checkbox"/> Retract needle into sheath <input type="checkbox"/> Unlock and remove needle and sheath	Yes / No Score ____/15
<b>8. Image analysis: CT scans (1 point each, target 10 points)</b> <input type="checkbox"/> Image 1 <input type="checkbox"/> Image 2 <input type="checkbox"/> Image 3 <input type="checkbox"/> Image 4 <input type="checkbox"/> Image 5 <input type="checkbox"/> Image 6 <input type="checkbox"/> Image 7 <input type="checkbox"/> Image 8 <input type="checkbox"/> Image 9 <input type="checkbox"/> Image 10	Yes / No  Score ____/10
<b>9. Image analysis: EBUS views (1 point each, target 10 points)</b> <input type="checkbox"/> Image 1 <input type="checkbox"/> Image 2 <input type="checkbox"/> Image 3 <input type="checkbox"/> Image 4 <input type="checkbox"/> Image 5 <input type="checkbox"/> Image 6 <input type="checkbox"/> Image 7 <input type="checkbox"/> Image 8 <input type="checkbox"/> Image 9 <input type="checkbox"/> Image 10	Yes / No  Score ____/10
<b>10. Decision-making tasks: (2 points each, target 10 points)</b> <input type="checkbox"/> Image 1 <input type="checkbox"/> Image 2 <input type="checkbox"/> Image 3 <input type="checkbox"/> Image 4 <input type="checkbox"/> Image 5	Yes / No Score ____/10

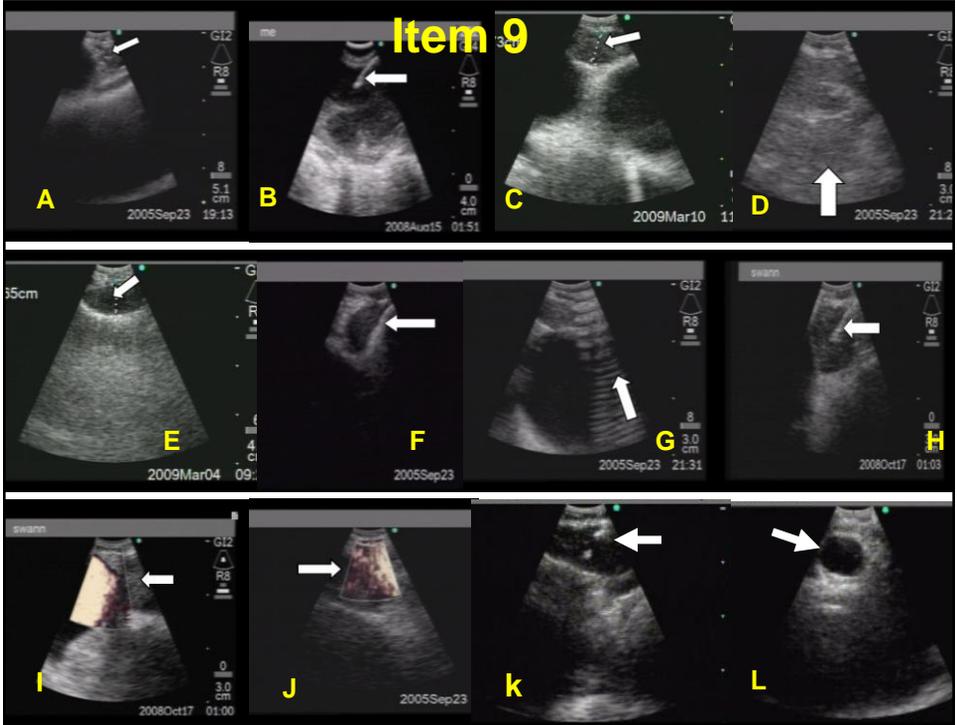
\* The combined use of the 10 items tests competencies needed to climb the learning curve from novice to advanced beginner to intermediate to competent bronchoscopist able to independently perform EBUS-TBNA.

**FINAL GRADE**      **PASS**      **FAIL**      **SCORE** \_\_\_\_\_/100

NAME \_\_\_\_\_



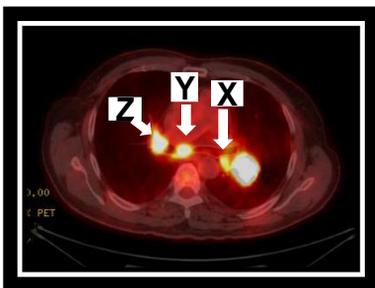
ITEM 8: Match the photo (A-L) to the corresponding 10 CT scan descriptions (Only one response per description)			
_____ Superior vena cava adjacent to 4R	_____ Inominate vein adjacent to 2R	_____ Pulmonary artery adjacent to 4L	_____ Aortic arch adjacent to 4L
_____ Azygos vein adjacent to 4R	_____ Station 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 9: 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
_____	_____	<b>NO RESPONSE</b>	
Station 7 adjacent to left atrium	Hilar node adjacent to normal lung		

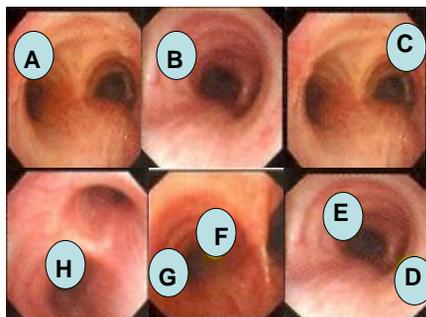
ITEM 10: Choose **One** best answer for each question

1. 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 \_\_\_\_\_

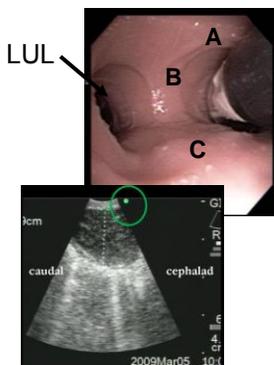
2. Where is the node located (needle insertion site A, B, C, D, E, F,G, or H) using white light bronchoscopy ?



Answer \_\_\_\_\_

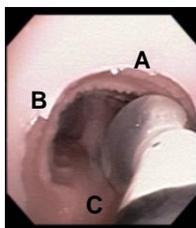
ITEM 10: Choose **One** best answer for each question

3. To sample level 11L, point the scope towards (A), (B), (C).



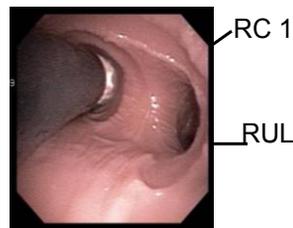
Answer \_\_\_\_\_

4. When sampling level 4R, consider pointing the scope towards A, B or C.



Answer \_\_\_\_\_

5. The Interlobar Pulmonary Artery is most likely seen when sampling level (A) 10R, (B) 11R, or (C) 12R



Answer \_\_\_\_\_

# User Instructions

## EBUS-STAT 10 Point Assessment Tool

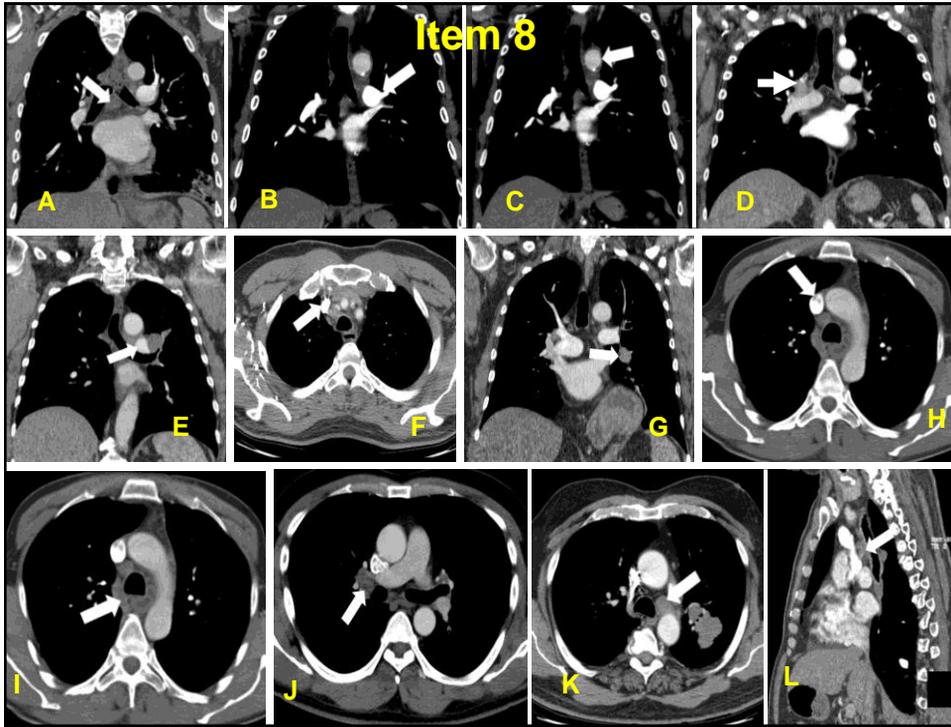
Learner: \_\_\_\_\_ Year of Training \_\_\_\_\_  
 Faculty \_\_\_\_\_ Date \_\_\_\_\_

<b>Educational Item*</b> Items 1-10 each scored separately	<b>Satisfactory Yes/No</b>
<p><b>1. Able to maneuver the scope through upper airway into trachea, without trauma or difficulty (5 points for single item tested)</b>  <input type="checkbox"/> Mouth and Vocal cords   <input type="checkbox"/> ET Tube   <input type="checkbox"/> Laryngeal mask airway            * Educators may wish to “test” only one technique applicable to their institution. This is an “All or None” exercise. No partial points are given. When EBUS-STAT is used as a learning instrument, all THREE techniques should be demonstrated in order to obtain FIVE points.</p>	<p>Yes / No  Score ____/5</p>
<p><b>2. Able to maneuver scope using white light bronchoscopy within tracheobronchial tree without trauma (4 points, no partial points)</b>  <input type="checkbox"/> Scope centered in airway lumen avoiding airway wall trauma            *The learner should be able to maneuver between lateral and medial walls without traumatizing main and minor carinas.</p>	<p>Yes / No  Score ____/4</p>
<p><b>3. Ultrasound image obtained without artifacts (5 points, no partial points)</b>  <input type="checkbox"/> Absence of artifacts on image, any target            *Targeting any nodal station, a sharp image without artifacts should be obtained.</p>	<p>Yes / No  Score ____/5</p>
<p><b>4. Identify major mediastinal vascular structures (4 points per item)</b>  <input type="checkbox"/> Aorta   <input type="checkbox"/> Pulmonary artery   <input type="checkbox"/> Superior vena cava   <input type="checkbox"/> Azygos vein   <input type="checkbox"/> Left atrium            *Each of the vascular structures should be identified on demand. It may be necessary to score this item in several patients.</p>	<p>Yes / No  Score ____/20</p>
<p><b>5. Identify lymph node station (Select 3 targets, 5 points each)</b>  <input type="checkbox"/> 2R   <input type="checkbox"/> 2L     <input type="checkbox"/> 4R   <input type="checkbox"/> 10R   <input type="checkbox"/> 7   <input type="checkbox"/> 4L     <input type="checkbox"/> 10L   <input type="checkbox"/> 11L   <input type="checkbox"/> 11Rs   <input type="checkbox"/> 11Ri            * Target stations are selected based on indication, anatomy, and instructor preference. To identify all nodal stations, more than one patient may be necessary. In this case, instructors may choose to readminister EBUS-STAT. Stations 2, 4, and 7 can be scored in a low-fidelity model.</p>	<p>Yes / No Score ____/15</p>
<p><b>6. Able to demonstrate EBUS processor functions (2 points each item)</b>  <input type="checkbox"/> Gain   <input type="checkbox"/> Depth   <input type="checkbox"/> Doppler            *Except for Doppler, these functions can be tested in either a low-fidelity model or patient.</p>	<p>Yes / No Score ____/6</p>
<p><b>7. Performance of EBUS-TBNA (1 point each, target 15 points)</b>  <input type="checkbox"/> Advance needle through working channel (neutral position)   <input type="checkbox"/> Secure needle housing by sliding the flange   <input type="checkbox"/> Release sheath screw   <input type="checkbox"/> Advance and lock sheath when it touches wall   <input type="checkbox"/> Release needle screw   <input type="checkbox"/> Advance needle using jab technique   <input type="checkbox"/> Visualize needle entering target node   <input type="checkbox"/> Move stylet in and out a few times   <input type="checkbox"/> Remove stylet   <input type="checkbox"/> Attach syringe   <input type="checkbox"/> Apply suction   <input type="checkbox"/> Pass needle in and out of node 10-15 times   <input type="checkbox"/> Release suction   <input type="checkbox"/> Retract needle into sheath</p>	<p>Yes / No Score ____/15</p>

<input type="checkbox"/> Unlock and remove needle and sheath *Ideally, while performing EBUS-TBNA, steps should be listed in order by the learner, according to the product manual. As needles and techniques evolve, the steps may change, but principles remain the same to assure equipment, operator, and patient safety, and obtain an adequate specimen.	
<b>8. Image analysis: CT scans (1 point each, target 10 points)</b> <input type="checkbox"/> Image 1 <input type="checkbox"/> Image 2 <input type="checkbox"/> Image 3 <input type="checkbox"/> Image 4 <input type="checkbox"/> Image 5 <input type="checkbox"/> Image 6 <input type="checkbox"/> Image 7 <input type="checkbox"/> Image 8 <input type="checkbox"/> Image 9 <input type="checkbox"/> Image 10 * This is a written test for which 1 point is given for each correct answer, to be used with associated slide-show or print-out.	Yes / No Score ____/10
<b>9. Image analysis: EBUS views (1 point each, target 10 points)</b> <input type="checkbox"/> Image 1 <input type="checkbox"/> Image 2 <input type="checkbox"/> Image 3 <input type="checkbox"/> Image 4 <input type="checkbox"/> Image 5 <input type="checkbox"/> Image 6 <input type="checkbox"/> Image 7 <input type="checkbox"/> Image 8 <input type="checkbox"/> Image 9 <input type="checkbox"/> Image 10 * This is a written test for which 1 point is given for each correct answer, to be used with associated slide-show or print-out.	Yes / No Score ____/10
<b>10. Decision-making tasks: (2 points each, target 10 points)</b> <input type="checkbox"/> Image 1 <input type="checkbox"/> Image 2 <input type="checkbox"/> Image 3 <input type="checkbox"/> Image 4 <input type="checkbox"/> Image 5 This is a written test for which 2 points are given for each correct answer, to be used with associated slide-show or print-out.	Yes / No Score ____/10

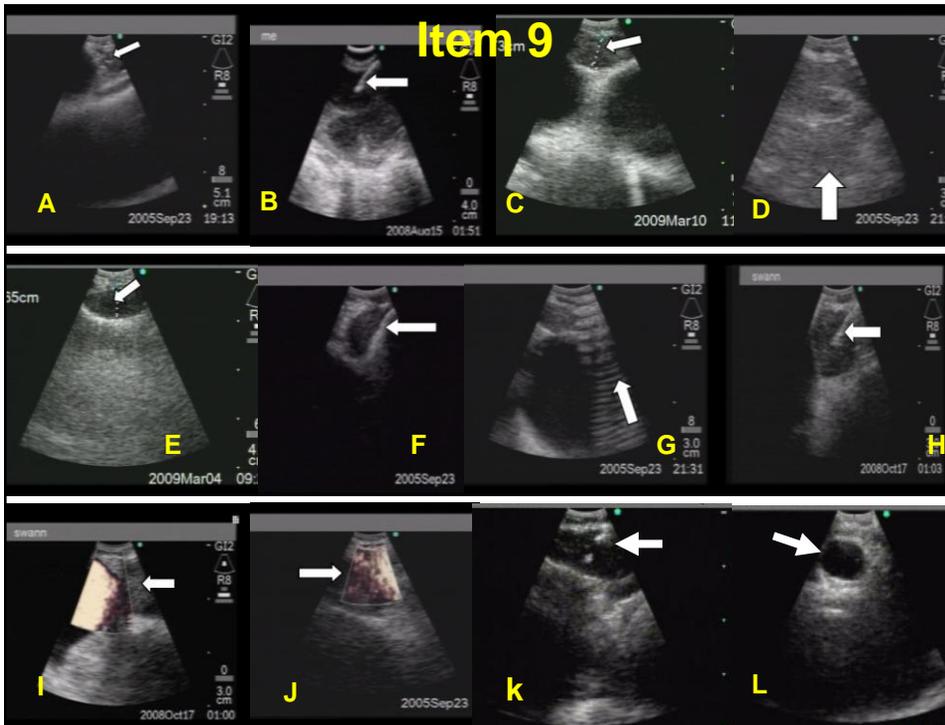
\* The combined use of the 10 items tests competencies needed to climb the learning curve from novice to advanced beginner to intermediate to competent bronchoscopist able to independently perform EBUS-TBNA.

**FINAL GRADE**      **PASS**      **FAIL**      **SCORE** \_\_\_\_\_/100



**ITEM 8: Match the photo (A-L) to the corresponding 10 CT scan descriptions (Only one response per description)**

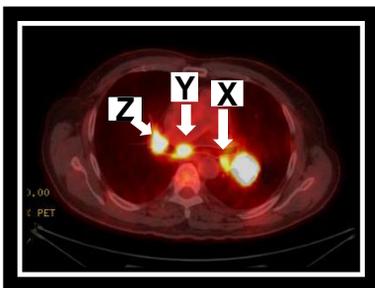
H Superior vena cava adjacent to 4R	F Inominate vein adjacent to 2R	B Pulmonary artery adjacent to 4L	C Aortic arch adjacent to 4L
I Azygos vein adjacent to 4R	A Station 7 adjacent to left atrium	G Station 11L with adjacent lung	D Station 10R
K Station 4L in axial view	E Pulmonary artery adjacent to 10L	NO RESPONSE	



ITEM 9: Match the photo (A-L) to the corresponding 10 EBUS views (Only one response per description)			
<p><b>A</b></p> <p>Station 4R adjacent to pulmonary artery superior vena cava and ascending aorta</p>	<p><b>F</b></p> <p>Needle penetrating through and through</p>	<p><b>B</b></p> <p>Needle missing target node</p>	<p><b>C</b></p> <p>Station 4L adjacent to aorta and pulmonary artery</p>
<p><b>I</b></p> <p>Station 4L adjacent to pulmonary artery</p>	<p><b>H</b></p> <p>Needle within lymph node</p>	<p><b>D</b></p> <p>Normal lung</p>	<p><b>G</b></p> <p>Reverberation artifact</p>
<p><b>J</b></p> <p>Station 7 adjacent to left atrium</p>	<p><b>E</b></p> <p>Hilar node adjacent to normal lung</p>	<p><b>NO RESPONSE</b></p>	

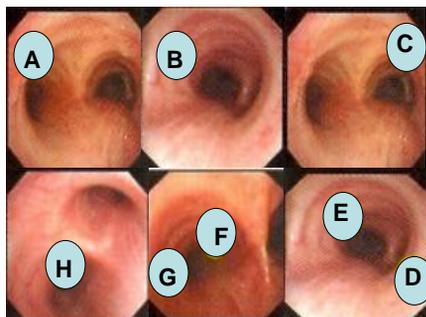
**ITEM 10: Choose One best answer for each question**

1. 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 Z**

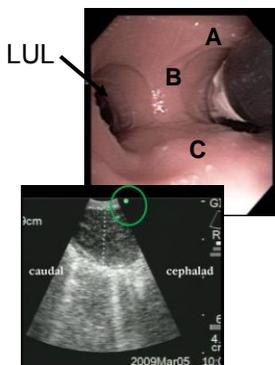
2. Where is the node located (needle insertion site A, B, C, D, E, F, G or H) using white light bronchoscopy ?



**Answer H**

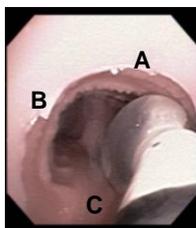
**ITEM 10: Choose One best answer for each question**

3. To sample level 11L, point the scope towards (A), (B), (C).



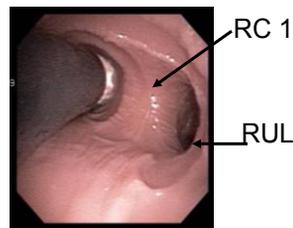
**Answer B**

4. When sampling level 4R, consider pointing the scope towards A, B or C.



**Answer A**

5. The Interlobar Pulmonary Artery is most likely seen when sampling level (A) 10R, (B) 11R, or (C) 12R



**Answer B**

## Endobronchial Ultrasound Self Assessment Tool (EBUS-SAT)

The purpose of this assessment tool is to provide bidirectional feedback between learner and instructor. There are no wrong answers. Well performed, this interaction will allow opportunities to ascertain strengths and weaknesses of a training program and educational methodologies. In addition, an open discussion will allow both learner and instructor to identify the learner's zones of proximal development and reflective capacity<sup>1</sup>. Educators may wish to ask learners to complete the EBUS-SAT prior to the encounter, and to then review each element of the questionnaire with the learner in order to identify perceived and real strengths or weaknesses in the performance of various elements of the EBUS-TBNA. Learners should 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      | ___ |

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Anatomy      Abnormalities      Technique      Equipment      Interpretation of findings

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

1	2	3	4	5
Poor	Below average	Average	Good	Excellent

**Using the above scale please rate this training program as**

**I have the following comments**

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<sup>1</sup> The constructivist psychologist Lev Vygotsky (1896-1934) believed that learning and development depend on social interaction. Focusing primarily on how children learn, he described a zone of proximal development (ZPD) as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (L.S. Vygotsky: *Mind in Society: Development of Higher Psychological Processes*, p. 86, John-Steiner, Cole, Scribner, and Soubberman Editors, Harvard University Press, 1980). Tinsley and Lebak expanded on this theory, describing a zone of reflective capacity in which adults increased their ability for critical reflection through feedback, analyses, and evaluation of one another's work in a collaborative working environment (Lebak, K. & Tinsley, R. Can inquiry and reflection be contagious? Science teachers, students, and action research. *Journal of Science Teacher Education*;2010;21;953-970).



Bronchoscopy International, Foundation for the Advancement of Medicine, is a transnational charitable organization whose members are devoted to bronchoscopy education. Our vision is that patients need not suffer the burden of medical procedure-related training. Our mission is to help physicians become skilled practitioners, and to make bronchoscopy more readily available to patients so that we might defeat the effects of lung disease around the world.

Bronchoscopy International partners with national, regional, and international medical societies to train physicians and their health care teams, donate equipment, and implement learning programs that support the democratization of knowledge. The organization has developed a six part curriculum to enhance cognitive, affective and experiential knowledge and technical skill. With implementation of the Bronchoscopy Education Project, we also offer a uniform curriculum to training centers and educators around the world. The project is officially endorsed by numerous professional medical associations. Learning resources include books and training manuals, instructional videos, patient-centered problem-based exercises, simulation scenarios, and interactive on-site and on-line seminars. Faculty Development Programs are conducted to nurture a cadre of expert educators. To learn more about Bronchoscopy International and our global activities, please go to [www.Bronchoscopy.org](http://www.Bronchoscopy.org).