FLEXIBLE BRONCHOSCOPY EDUCATION PROJECT

Training manual for program directors and bronchoscopy instructors

Subject: Introduction to Flexible Bronchoscopy Competency Program

Henri Colt MD, FCCP
Professor of Medicine
University of California, Irvine
hcolt@uci.edu

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BRONCHOSCOPY EDUCATION PROJECT

TEACHERS

Welcome to **the Bronchoscopy Education Project**. The purpose of this project is to provide bronchoscopy educators and training program directors in the United States and abroad with competency-oriented tools and materials with which to train student bronchoscopists and assess progress along the learning curve from novice to competent practitioner. Material can be incorporated in whole or in part, as needed by each program.

The foundation of this project is a standardized curriculum (schedule, content, checklists, assessment tools, training models, and train-the-trainers instruction) pertaining to an ***Introductory Course in Flexible Bronchoscopy***. This course addresses bronchoscopic inspection, lavage, brushing and endobronchial biopsy, transbronchial lung biopsy and conventional transbronchial needle aspiration.

Modeled on this curriculum, work is in progress for programs pertaining to (a) endobronchial ultrasound, (b) interventional flexible bronchoscopy, and (c) rigid bronchoscopy.

This project is ongoing and will be updated at www.bronchoscopy.org as components become available. We invite your comments as you use these materials.

Henri Colt MD., FCCP
hcolt@uci.edu

Eric Edell MD., FCCP
eedell@mayo.edu

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*Answer grids should not be released to students so that assessment tools can continue to be used during local and regional programs. For copies of assessment tools and answer grids, please contact Henri Colt MD at hcolt@uci.edu

§ Checklists, Assessment Tools, and Bronchoscopy Step-by-Step Narrative created by Mohsen Davoudi MD and Henri Colt MD

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The Introduction to Flexible Bronchoscopy Curriculum contains:

1. Introduction to *Flexible Bronchoscopy Competency Program Completion*
2. *Regional Introductory courses* comprised of didactic lectures, interactive sessions and simulation-based hands-on workshops using a pre-test/post-test model to document cognitive knowledge and technical skill acquisition..
3. Mandatory reading assignments:
   - *The Essential Bronchoscopist*©, a six module, 186 questions/answer Web-based study guide with downloadable PDF files and post-tests.
   - *Moderate Sedation* Module with didactic lecture, synopsis and checklist.
   - *Fluoroscopy* Module with didactic lecture, synopsis and checklist.
4. The *Bronchoscopy Step-by-Step* procedural skill accumulation curriculum
5. A series of *simulation workshops* that include:
   - An *informed consent-patient safety-procedural pause* simulation also including instruction in the use of universal, droplet, and airborne pathogens precautions.
   - A *flexible bronchoscopy inspection with BAL, biopsy and brushing scenario,* using inanimate models and/or high-fidelity computer-based simulation.
   - A *flexible bronchoscopy inspection with transbronchial lung biopsy and/or transbronchial needle aspiration scenario,* using inanimate models and/or high-fidelity computer-based simulation.
6. A series of *observed real-patient scenarios* which include:
   - An *informed consent-patient safety-procedural pause* scenario.
   - A *flexible bronchoscopy inspection with BAL, biopsy* and *brushing* scenario.
   - A *flexible bronchoscopy inspection with transbronchial lung biopsy and/or transbronchial needle aspiration* scenario.
7. A series of interactive (instructor-student) *Practical Approach to Procedural Decision-making* workshops
8. A *proctored real patient bronchoscopy* with competency assessment.
9. A collection of *Assessment* tools used to monitor progress:
   - Bronchoscopy Skills and Tasks Assessment Tool (BSTAT)
   - BSTAT-TBLB and TBNA Assessment Tool
10. A collection of *Checklist* tools used to monitor progress:
    - Informed consent checklist
    - Procedural pause checklist
    - Fluoroscopy checklist
    - Moderate sedation checklist
    - Proctored flexible bronchoscopy checklist
11. A synopsis to the *Train-the-Trainers Manual* and two day course curriculum, including specific instructions on how to use this Introductory Curriculum and the associated Assessment Tools and Checklists.

Most of the materials for this project can be accessed via Bronchoscopy International at http://www.Bronchoscopy.org

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Section 1

Introduction to Bronchoscopy Competency Program Completion

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Recommendations for Using the Introduction to Bronchoscopy Competency Program Completion

This checklist contains all of the elements comprised in the basic flexible bronchoscopy curriculum. The purpose of this curriculum is to help trainees climb the learning curve from novice and advanced beginner to intermediate and then competent bronchoscopist, able to perform flexible bronchoscopy independently.

Not all students will progress at the same speed. It is also assumed that students may become competent at certain procedures before they become competent in others. The frequency with which the checklists and assessments tools pertaining to the individual components of the curriculum need to be administered has not yet been ascertained.

This curriculum assures that all students have completed certain materials to the satisfaction of their instructors. It is understood that some students may need to repeat certain elements of the curriculum until they obtain a passing grade. Some institutions may wish for their trainees to repeat parts of the curriculum during the course of their training (yearly for example, or during the months prior to completing their training).

To maximize objective scoring, each element in the program checklist has been defined explicitly in this user manual. Participation in specially-designed *Train-the-Trainers* courses (being currently organized) is encouraged to assist with standardization and heping instructors use this program to its fullest potential.

A PASS grade signifies that each student has achieved a satisfactory (passing) score in each of the ten elements contained in the curriculum. The overall number of procedures performed by the student should also be recorded; it is recommended that students keep a diary-log of their procedures, and that program directors conduct feedback sessions with students to monitor patient-care related outcomes.

Introduction to Flexible Bronchoscopy Competency Program Completion Checklist

Educational Item	Completed Yes/No	Assessment Item	Pass/Fail/Incomplete
1. Participation in regional introductory course if available*	Yes / No	Post-test scores Target 12/20 (60% correct) Score _____%	Pass / Fail / Incomplete
2. Mandatory reading: Web-based *Essential Bronchoscopist* • Module 1 • Module 2 • Module 3 • Module 4 • Module 5 • Module 6 Sedation Module Fluoroscopy Module	Yes / No Yes / No Yes / No Yes / No Yes / No Yes / No Yes / No Yes / No Yes / No	Post-test scores Target 7/10 (70% correct) Score _____ Score _____ Score _____ Score _____ Score _____ Score _____ Score _____ Score _____	Pass / Fail / Incomplete Pass / Fail / Incomplete Pass / Fail / Incomplete Pass / Fail / Incomplete Pass / Fail / Incomplete Pass / Fail / Incomplete Pass / Fail / Incomplete Pass / Fail / Incomplete Pass / Fail / Incomplete
3. Informed consent, patient safety, and procedural pause simulation workshop	Yes / No	IC 10-pt Checklist Target 100% Score _____%	Pass / Fail / Incomplete
4. Informed consent, patient safety, and procedural pause patient-based scenario	Yes / No	IC 10-pt Checklist Target 100% Score _____%	Pass / Fail / Incomplete
5. Practical Approach interactive workshop	Yes / No	Subjective scores Target Pass	Pass / Fail / Incomplete
6. Flexible bronchoscopy simulation workshop	Yes / No	Target scores 100% BSTAT _____% TBLB/TBNA ____%	Pass / Fail / Incomplete
7. Flexible bronchoscopy patient-based scenario	Yes / No	Target scores 100% BSTAT _____% TBLB/TBNA ____%	Pass / Fail / Incomplete
8. Proctored case bronchoscopy checklist	Yes / No	FB 10-pt Checklist Target 100% Score _____%	Pass / Fail / Incomplete

* Currently available to 5-8 institutions in each of the following regions: Southern California, Upper Midwest, Southeast, Texas, and Northeast. Additional regional sites are being developed for face-to-face interaction as well as a web-based program.

Section 2

Regional Courses

Regional Introductory courses comprised of didactic lectures, interactive sessions and simulation-based hands-on workshops using a pre-test/post-test model to document cognitive knowledge and technical skill acquisition.

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User Instructions

Regional Courses (1 day)
Introduction to Flexible Bronchoscopy

Learning bronchoscopy in the clinical setting promotes learner anxiety, subjects patients to the burden of procedure-related education [1], and results in a highly variable learning experience [2]. Clinical responsibilities often interfere with reading of bronchoscopy-related material, and, in the absence of periodic assessments of bronchoscopy-related knowledge, trainees are unlikely to be compliant with educational endeavors they perceive as optional or reliant on individual motivation, especially if there are no pass/fail grading consequences [3]. The current subspecialty bronchoscopy learning environment is further rendered less-than-ideal for beginners because of concerns regarding patient safety, fiscal constraints, and an increasing impetus to document procedural competency [4-6].

Whilst not supplanting on-the-job training that occurs with subspecialty rotations, short postgraduate courses comprised of lectures and simulation-based hands-on instruction, have thus become a popular means towards enhancing procedure-related learning [7-9]. In accordance with continued medical education (CME) guidelines, these programs identify learner objectives and provide opportunities for feedback from students regarding the perceived quality of the course.

The purpose of regional courses is to provide standardized learning material to bronchoscopy trainees. By regionalizing the process, program directors can enlist participants from numerous regional programs, thereby reducing course-related expenditures pertaining to travel and lodging. Already, several courses have become highly popular in the Carolinas, Southern California, and Midwest. Other regional courses are planned in the Northeast, Texas, and Southeast. During course participation, students are exposed to standardized course material delivered using didactic lectures, interactive sessions, hands-on training using patient models, low-fidelity and high-fidelity simulation, debriefing exercises, and problem-based learning modules. Pre-test/post-test assessments help document knowledge and technical skill acquisition, thereby setting a new baseline for students in subspecialty training.

It has long been recognized that assessment drives learning, and that rigorous assessment inspires learning, reinforces confidence, and reassures the public. Proving that course participation is responsible for learning gains is difficult. For example, demonstrating the short-term benefit of an educational intervention is controversial because of debates regarding the value of pre-test and post-test assessments, and because of the obvious difficulty constituting a control group to which studies of an educational intervention can be compared [10-13]. Studies of long-term retention are problematic because causality is subject to the effects of normal maturation and ongoing training history [14].

The true value of pre-test/post-test assessments has also been controversial because of the effects of many extraneous variables, which include the Hawthorne effect (knowing that one is being tested may affect the results), the halo effect (the human tendency to respond positively or negatively to an instructor), and the practice effect (of a pre-test on a subsequent post-test). In the context of procedure-based training, the calculation of various measures of learning gain, including class-average and single-student normalized gain provides an objective and informative means to document learner performance and demonstrate robustness of the educational intervention.

Patients should not bear the burden of procedure-related training. Participation in regional courses, using simulation-based deliberate practice to acquire technical skill, and documenting a rapid climb up the initially steep slope of the novice's learning curve should result in decreased patient suffering and improved procedure-related decision making. Diverse opinions regarding educational methodologies, curricular structure, and measures of effectiveness persist in regards to short one- or two-day programs [15-16]. Additional studies are therefore needed, not only to document the effectiveness of regional courses, but also to determine how such courses might favorably impact patient outcomes.

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Example of Course Schedule (Southern California, with participation of 7 different training institutions)

One day Introductory Bronchoscopy Course for First Year Pulmonary and Critical care Medicine Trainees

7:30-8:15 am	Registration, pre-course technical skill assessments
8:15-8:30	Welcome, introduction, and learning objectives
8:30-9:00	Pretest and survey of practice experience
9:00-9:20	Patient safety: Pre-bronchoscopy evaluation
9:20-9:40	Patient safety: Bronchoscopy in special populations
9:40-10:15	Preventing and managing airway complications
10:15-10:30	BREAK
10:30-10:45	Anatomic relationships
10:45-11:15	Bronchoscopic airway inspection
11:15-11:45	Evaluation of central airway obstruction
11:45-12:00	Basic diagnostic procedures (lavage, brushings, and biopsy)
12:00-12:30	Transbronchial lung biopsy
12:30-1:00	Practical approach to transbronchial needle aspiration
1:00-2:00	LUNCH
Afternoon hands-on training 2:00-4:30 pm	Hands-on training: 5 stations - 30 minutes per station (1) Airway anatomy and bronchoscopy step by step (2) Endobronchial brushings, and endobronchial biopsy (3) Transbronchial needle aspiration (4) Emergency bronchoscopic intubation (5) Diagnostic strategies: interactive small group session
4:30-4:45	Post course technical skills learning assessment
4:45-5:15	Post course cognitive learning assessment
5:15-5:30	Interactive session: True-False exercices
5:30-6:00 pm	Wrap up; certificate of course completion

Introductory Flexible Bronchoscopy: Hands-On Workstations

Workstation 1: Airway Anatomy & Bronchoscopy Step by Step

Learning Objectives:

1. To be able to enter the airway from the larynx atraumatically and navigate down the trachea maintaining the bronchoscope in the midline.
2. To learn to practice the basic "right-left" maneuver.
3. To become familiar with right-sided exercises.
4. To become familiar with left-sided exercises.
5. To be able to identify bronchial segmental anatomy, and understand the standard order of segmental airway examination.

Description:

The instructor will first demonstrate step by step principles and techniques of airway examination. Students will then use simulation to learn bronchial anatomy, and focus on principles that include keeping the scope in the midline, avoiding wall trauma (red out), identifying and entering bronchial segments appropriately, and performing certain left and right sided exercises. This educational principle resides on the concept of muscle memory, repetition, and focused practice.

Workstation 2: Endobronchial Brushing & Endobronchial Biopsy

Learning Objectives:

1. To be able to brush a simulation of a mucosal lesion using proper communication skills and technique while maintaining the bronchoscope in the midline and without causing airway trauma.
2. To be able to biopsy a simulation of a mucosal lesion using proper communication skills and technique while maintaining the bronchoscope in the midline and without causing airway trauma.

Description:

The instructor will guide the student as the student brushes and biopsies an airway abnormality. Another student will serve as the bronchoscopy assistant, so that the "bronchoscopist" may practice and learn proper communication skills such as "brush out, brush in, open forceps, close forceps" while maintaining proper bronchoscopic technique.

Workstation 3: Transbronchial Needle Aspiration

Learning Objectives:

1. To be able to demonstrate three different techniques of needle insertion: hub against wall, piggyback, and jab technique.
2. To be able to demonstrate three ways to protect the bronchoscope during needle aspiration: Straightening the scope during needle insertion and removal, complete

visualization of the needle during retraction from the airway wall, pulling the needle completely into the sheath before removal through the bronchoscope.

Description:

The instructor will first demonstrate videobronchoscopy and each of the three techniques of TBNA with the help of a bronchoscopy assistant. TBNA will be performed through the carina into subcarinal adenopathy of the specially lo-fidelity airway model. The instructor will also describe different ways with which to assure patient and operator safely, and ways in which the flexible bronchoscope is protected. Each team member will then demonstrate needle insertion techniques, while another team member serves as the bronchoscopy assistant, making sure that patient, operator, and equipment safety are assured.

Workstation 4: Difficult Airway: Emergency Bronchoscopic Intubation

Learning Objectives:

1. The learner should be able to manage a normal, emergency airway, using mask ventilation, laryngoscopic intubation, and fiberoptic intubation.
2. The learner should be able to intubate a patient with a difficult airway (limited jaw range of motion, swollen tongue) using the flexible bronchoscope

Description:

Intubation in the patient with a difficult airway is a life-saving procedure. It is a time when family members, nursing team, physicians, and respiratory therapists are at the bedside assisting and watching. It is a time for the bronchoscopist to take control of the situation, use the airway team wisely in order to maintain an environment of calm, trust, and efficacy.

Workstation 5: Diagnostic Strategies: Interactive Small Group Session

Learning Objectives:

1. The learner should be able to proceed through the 4-Box Practical Approach model, knowing the significance of each box.
2. The learner should be able to analyze a bronchoscopic case by walking a colleague through the process of initial patient evaluation, assessment of procedural strategies, discussion of procedural techniques and results, and devising long-term management plans.

Description:

In this interactive session, the instructor opens up the floor to the learners, and together they walk through a complicated case using the 4-Box Practical Approach model, working their way through initial patient evaluation, assessment of procedural strategies (including indications and contraindications, expected results, and risk-benefit analysis), discussion procedural techniques and results (including choosing among technical options and instruments, knowing the anatomic risks, results, and possible complications and how to deal with each), and devising long-term management plans (including assessment of the results, plan for follow-up diagnostic and therapeutic options, along with quality improvement for the procedural team).

Section 3

Mandatory Reading

Mandatory reading:*

- *The Essential Bronchoscopist*©: Six modules, 186 questions/answer web-based study guide with downloadable PDF files
  - Moderate Sedation module
    - Fluoroscopy module

* Checklists and post-tests used at the discretion of program director.

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User Instructions

Mandatory reading of the 6 module, 186 question/answer Essential Bronchoscopist© with post-tests

The web-based Essential Bronchoscopist© (referred to as the EB©) is a laddered curriculum of theoretic bronchoscopic knowledge that can be accessed free of charge in English, French, Spanish, Portuguese, Vietnamese, Japanese, and Korean (with Italian and Chinese translations in progress). This online and downloadable text has been officially endorsed as a complementary educational tool by several national and international bronchology and pulmonary organizations (including those from Argentina, Singapore, Belgium, Malaysia, Spain, France, Brazil, Korea, and Japan, as well as by the American Association for Bronchology, The South American Association for Bronchoesophagology, and the World Association for Bronchology). The EB© website is HON code certified (Health on the Net).

The EB© is just one component of an online curriculum being established by an increasing international forum of expert bronchoscopists and educators (see Bronchoscopy International, at www.bronchoscopy.org). This is a free, web-based six-part basic curriculum that deconstructs procedures into three elements: strategy and planning, technical skills, and outcomes assessment (quality control and ability to respond to complications). In order to identify the elements crucial to medical reasoning when entertaining a bronchoscopy consultation, these elements are further deconstructed into four categories using a four box practical approach to procedural decision making: patient evaluation, procedural strategies, techniques, and outcomes described on one of the six elements of the curriculum, called the practical approach to procedural decision making.

This curriculum is being increasingly used as a foundation for standardized curricula delivered by experienced bronchoscopy educators who have participated in specially designed “train the trainers” courses established by Bronchoscopy International, in order to provide one day seminars in countries such as Argentina, the United States, Vietnam, Singapore, the Philippines, and India.

The EB© itself is comprised of six modules, each with a module-specific competency-based learning objective, totaling 186 multiple-choice question-answer sets, viewable online (available at http://bronchoscopy.org/ under the link 'Essential Bronchoscopist') and also downloadable as PDF files. Each question-answer set contains information pertaining to the major topics represented in traditional textbooks of bronchoscopy (anatomy and airway abnormalities, patient preparation, indications, contraindications and complications, techniques and solutions to technical problems, lung cancer and infections, bronchoalveolar lavage, lung biopsy techniques, therapeutic and interventional bronchoscopy, anesthesia and medications, equipment and its maintenance, as well as history and education).

The aim of the EB© is not to replace but to complement the conventional apprenticeship model of training in bronchoscopy by emphasizing important facets of knowledge and skill required for competency, and by encouraging trainees to discuss these with their preceptors and colleagues. Elements addressed in the Essential Bronchoscopist© are intentionally written so that contrary opinions might occasionally be provided by instructors. In this fashion, dialogue is promoted, but access to a certain amount of "essential" material is guaranteed. In one study, conducted in Argentina and the US, select material from the question-answer sets of the EB©, were used to create a validated test of bronchoscopic knowledge. Questions from the EB© have also been used in other studies pertaining to bronchoscopy education.

In order to document that a student has been exposed to material contained in the EB©, a passing score on each of the post-tests is warranted. Each test can be taken three times if a passing score is not achieved on the first try. All students should document a passing score as proof that they have completed the module. A score of 70 and above (7 correct responses) allows the student to move on to the next module using the online version. After three attempts, however, the next module can be accessed regardless of one's score. The print-out of one's passing scores can be placed in the student's file and the program director can check off the module as completed on the Bronchoscopy Education Competency Checklist.

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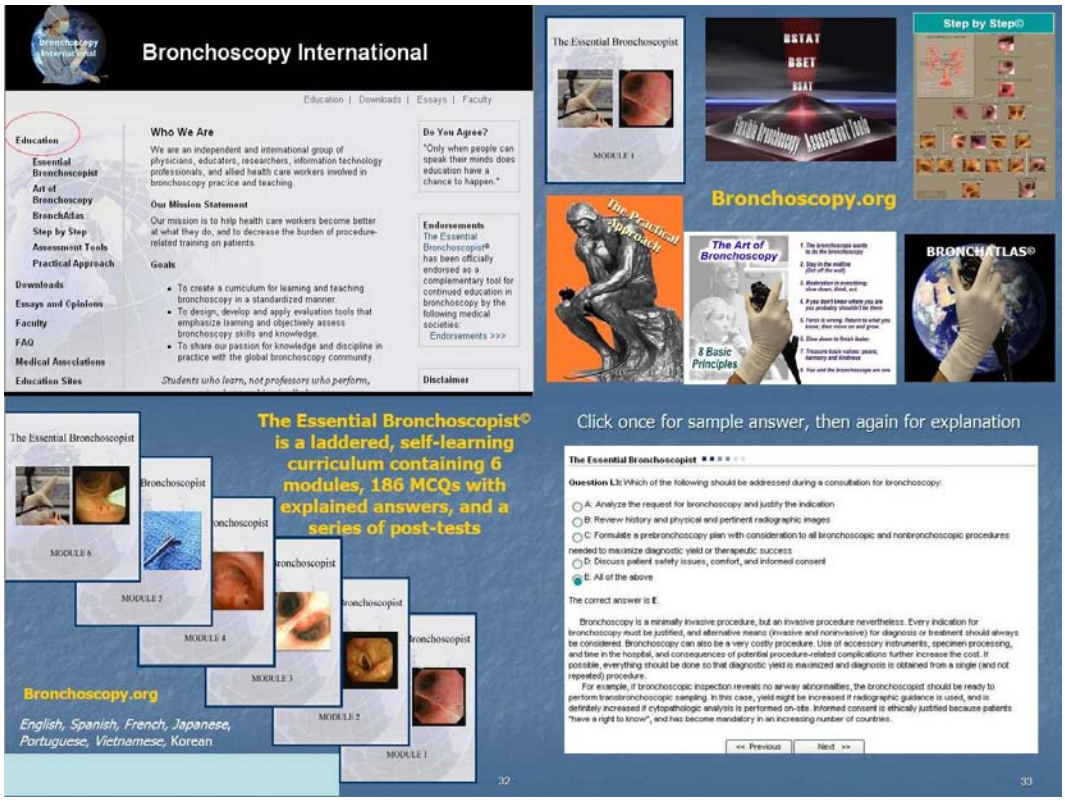
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Education
Essential Bronchoscopist
Art of Bronchoscopy
BronchAtlas
Step by Step
Assessment Tools
Practical Approach
Downloads
Essays and Opinions
Faculty
FAQ
Medical Associations
Education Sites
Who We Are
We are an independent and international group of physicians, educators, researchers, information technology professionals, and allied health care workers involved in bronchoscopy practice and teaching.
Our Mission Statement
Our mission is to help health care workers become better at what they do, and to decrease the burden of procedure-related training on patients.
Goals
To create a curriculum for learning and teaching bronchoscopy in a standardized manner.
To design, develop and apply evaluation tools that emphasize learning and objectively assess bronchoscopy skills and knowledge.
To share our passion for knowledge and discipline in practice with the global bronchoscopy community.
Students who learn, not professors who perform,
Do You Agree?
"Only when people can speak their minds does education have a chance to happen."
Endorsements
The Essential Bronchoscopist® has been officially endorsed as a complementary tool for continued education in bronchoscopy by the following medical societies:
Endorsements >>>
Disclaimer
The Essential Bronchoscopist
MODULE 1
BSAT
BSET
BSAT
Flexible Bronchoscopy Assessment Tools
Step by Step©
Bronchoscopy.org
The Practical Approach
The Art of Bronchoscopy
8 Basic Principles
BRONCHATLAS©
The Essential Bronchoscopist© is a laddered, self-learning curriculum containing 6 modules, 186 MCQs with explained answers, and a series of post-tests
MODULE 6
MODULE 5
MODULE 4
MODULE 3
MODULE 2
MODULE 1
Bronchoscopy.org
English, Spanish, French, Japanese, Portuguese, Vietnamese, Korean
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Click once for sample answer, then again for explanation
The Essential Bronchoscopist
Question 1.3: Which of the following should be addressed during a consultation for bronchoscopy:
A: Analyze the request for bronchoscopy and justify the indication
B: Review history and physical and pertinent radiographic images
C: Formulate a prebronchoscopy plan with consideration to all bronchoscopic and nonbronchoscopic procedures needed to maximize diagnostic yield or therapeutic success
D: Discuss patient safety issues, comfort, and informed consent
E: All of the above
The correct answer is E.
Bronchoscopy is a minimally invasive procedure, but an invasive procedure nevertheless. Every indication for bronchoscopy must be justified, and alternative means (invasive and noninvasive) for diagnosis or treatment should always be considered. Bronchoscopy can also be a very costly procedure. Use of accessory instruments, specimen processing, and time in the hospital, and consequences of potential procedure-related complications further increase the cost. If possible, everything should be done so that diagnostic yield is maximized and diagnosis is obtained from a single (and not repeated) procedure.
For example, if bronchoscopic inspection reveals no airway abnormalities, the bronchoscopist should be ready to perform transbronchoscopic sampling. In this case, yield might be increased if radiographic guidance is used, and is definitely increased if cytopathologic analysis is performed on-site. Informed consent is ethically justified because patients "have a right to know", and has become mandatory in an increasing number of countries.
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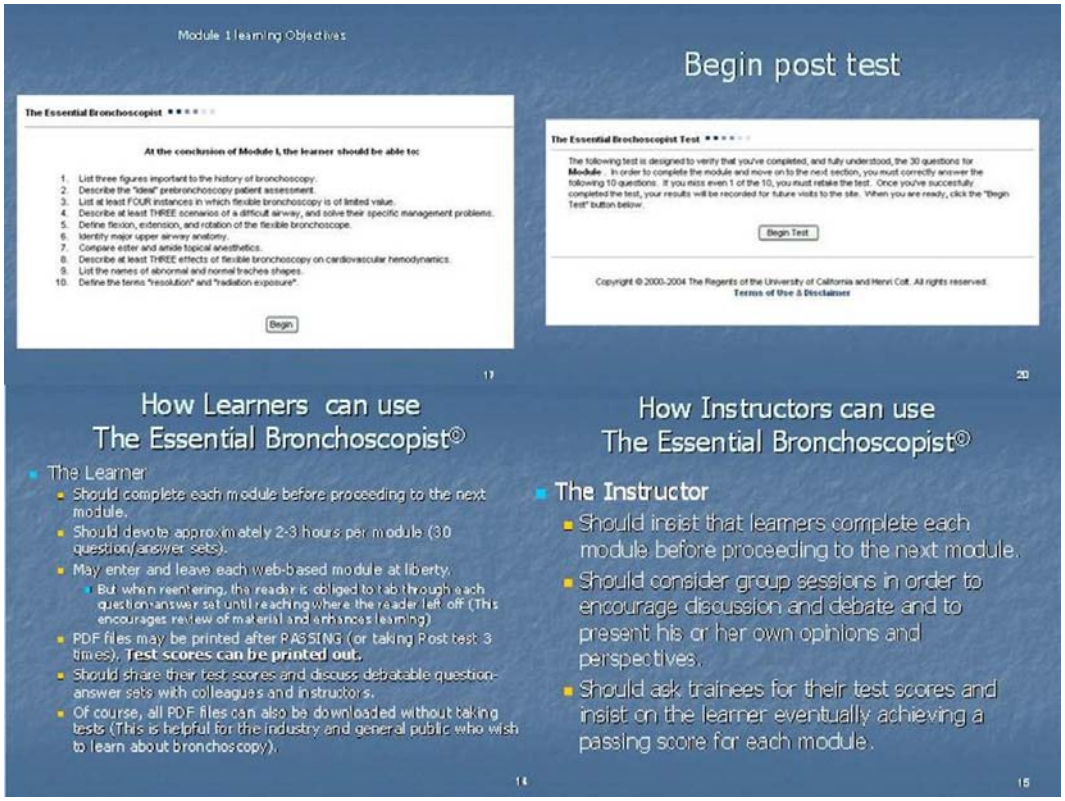
Module 1 learning Objectives
The Essential Bronchoscopist
At the conclusion of Module I, the learner should be able to:
1. List three figures important to the history of bronchoscopy.
2. Describe the "ideal" prebronchoscopy patient assessment.
3. List at least FOUR instances in which flexible bronchoscopy is of limited value.
4. Describe at least THREE scenarios of a difficult airway, and solve their specific management problems.
5. Define flexion, extension, and rotation of the flexible bronchoscope.
6. Identify major upper airway anatomy.
7. Compare ester and amide topical anesthetics.
8. Describe at least THREE effects of flexible bronchoscopy on cardiovascular hemodynamics.
9. List the names of abnormal and normal trachea shapes.
10. Define the terms "resolution" and "radiation exposure".
Begin
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Begin post test
The Essential Bronchoscopist Test
The following test is designed to verify that you've completed, and fully understood, the 30 questions for Module . In order to complete the module and move on to the next section, you must correctly answer the following 10 questions. If you miss even 1 of the 10, you must retake the test. Once you've successfully completed the test, your results will be recorded for future visits to the site. When you are ready, click the "Begin Test" button below.
Begin Test
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How Learners can use The Essential Bronchoscopist©
The Learner
Should complete each module before proceeding to the next module.
Should devote approximately 2-3 hours per module (30 question/answer sets).
May enter and leave each web-based module at liberty.
But when reentering, the reader is obliged to tab through each question-answer set until reaching where the reader left off (This encourages review of material and enhances learning)
PDF files may be printed after PASSING (or taking Post test 3 times), Test scores can be printed out.
Should share their test scores and discuss debatable question-answer sets with colleagues and instructors.
Of course, all PDF files can also be downloaded without taking tests (This is helpful for the industry and general public who wish to learn about bronchoscopy).
14
How Instructors can use The Essential Bronchoscopist©
The Instructor
Should insist that learners complete each module before proceeding to the next module.
Should consider group sessions in order to encourage discussion and debate and to present his or her own opinions and perspectives.
Should ask trainees for their test scores and insist on the learner eventually achieving a passing score for each module.
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User Instructions

Mandatory reading of the Moderate Sedation and Fluoroscopy modules

The purpose of these mandatory readings is to provide students with exposure to basic principles pertaining to the use of moderate sedation during bronchoscopy, and to the use of fluoroscopy during bronchoscopy. While it is presumed that institutions have their own regulations and protocols, many do not have a formal program of education in these two areas.

The inappropriate use of sedation and fluoroscopy can severely affect patient safety. It is for this reason that we believe knowledge in these two areas is necessary, and it is also why we have prepared special checklists so that instructors can document the acquisition of knowledge during the course of training.

We recommend at least ONE formal session during which a didactic lecture on each of these two subjects is provided (after students have reviewed the synopsis and other reading material on these two subjects). Checklists can be reviewed at a separate and individual session, or during the course of day-to-day procedural training.

MODERATE SEDATION

SYNOPSIS

The purpose of this synopsis is to provide the reader with a brief overview of moderate sedation as it might apply to flexible bronchoscopy. It is assumed that institutions and practitioners have different biases and regulations. Herein a short summary is provided so that beginner bronchoscopists might acquire at least some of the elements necessary for a safe procedure. Readers are encouraged to follow guidelines and protocols established in their own institutions.

Definitions

- Moderate sedation may be produced by the use of intravenous, oral, transmucosal or intramuscular narcotics, sedatives or anxiolytic medications
- Moderate sedation is a medically controlled state of depressed consciousness that allows protective reflexes to be maintained, while retaining the patient's ability to maintain a patent airway independently and continuously. This implies that the patient is mildly drowsy but arouses to voice easily. This is to be distinguished from
- Deep sedation, where the patient is arousable only by vigorous stimulation and may lose the ability to maintain airway patency and protection.

ASA Classification

- ASA 1: normal and healthy patient
- ASA 2: Mild controlled systemic disease and no functional limitation
- ASA 3: Moderate to severe systemic disease that limits activity.
- ASA 4: severe systemic disease that is a constant threat to life or is functionally incapacitating.
- ASA 5: Moribund and not expected to survive without surgery

Equipment

- Informed consent for sedation should be obtained in addition to consent for the procedure.
- Oximetry
- Ability to monitor the patient for vital signs, airway patency, degree of wakefulness.
- Electrocardiogram
- Intravenous access
- Rescue equipment for any patient moving into deep sedation, including crash cart and defibrillator
- Appropriate size endotracheal tubes and ability to ventilate patient (including self-inflating Ambu-bag and mask system) should be available.
- Reversal agents for narcotics and benzodiazepines

- Charting should include baseline ventilatory, hemodynamic, neurologic status, time of administration of medication, dose administered, type of medication used, physical examination, informed consent, allergies, nothing to eat 8 hours prior to the procedure (except for clear liquids and medications, up to four hours prior to procedure).
- Ability to monitor patient status at least every 15 minutes during the procedure and for a minimum of thirty (30) minutes after the procedure and/or until patient returns to baseline status, including pulse oximetry equal or greater than 92% on room air, or assured with supplemental oxygen if patient on oxygen.
- Following administration of reversal agents such as naloxone, patient should not be discharged for a minimum of one (1) hour, and flumazenil two (2) hours.

Potential contrandications

- Uncooperative patients
- Mentally ill patients
- Severe cardiac, pulmonary, hepatic, renal or central nervous disease
- Pregnancy
- Morbid obesity
- Alcohol or drug abuse
- History of sleep apnea

High risk patients

- Previous problems with anesthesia or sedation
- Previous surgery or radiation or injury to neck or face
- Stridor, snoring, or sleep apnea
- Dysmorphic facial features
- Advanced rheumatoid arthritis
- Significant obesity, protruding teeth
- Small mouth opening (<3cm in adults), macroglossia, non-visible uvula, tonsillar hypertrophy, short neck, limited neck extension, decreased hyoid-mental distance (<3cm in adult).

Response to complications

- Ability to rotate patient onto lateral decubitus position in case of vomiting.
- Ability to insert a nasal trumpet
- Ability to perform chin lift/neck extension in case of obstructed airway
- Oral suction should always be available
- Ability to establish a safe and patent airway, and provide hemodynamic and circulatory support in case of compromise.

Specific medications

- *Midazolam* (Versed) is currently the most widely used agent for moderate sedation and anxiolysis. It is a water-soluble benzodiazepine with rapid onset of action. It is four times more potent on a mg per mg basis than

    - When administered intravenously, sedation and anxiolysis usually occurs within 2 minutes. Complete recovery of motor performance and consciousness occurs within one hour in most individuals.

- Combining Midazolam and opioides increases the incidence of apnea. Large doses can produce prolonged drowsiness and cardio-respiratory arrest. Central nervous system dysfunction, including confusion and seizures can be seen in patients with brain metastases and paraneoplastic syndromes.
- Ventilation is depressed by 0.15 mg/kg, especially in patients with COPD. The peak effect of respiratory depression occurs at three minutes following injection and remains for approximately 15 minutes. It can be most pronounced in geriatric and COPD patients.

• *Fentanyl* is a synthetic opiate analog that is structurally different from morphine or meperidine. It is 100 times more potent than morphine. The usual adult dose is 50-100 micrograms. Given intravenously, its onset of action and maximum respiratory depression effect occurs about 5-10 minutes after administration, and lasts 30-60 minutes.

- Given intramuscularly, the onset of action is within 7-15 minutes with duration of action lasting up to two hours.
- Fentanyl should never be used in patients receiving MAO inhibitors because of increased risk of respiratory depression and coma.

• *Combination drugs*. Sedative responses are increased in patients who have received opioides or other benzodiazepines. Level of sedation and risk for respiratory depression are increased in the elderly and in patients with pre-existing respiratory dysfunction.

• *Reversal agents***:**

- Naloxone is a pure opiate antagonist that reverses all effects and side effects of opiates.). The initial dose is 0.1-0.2 mg IV, SQ, IM or via endotracheal tube and can be repeated every 2 minutes. The onset of action is about 30 seconds. Actually, no more than 0.4 mg should be administered because this might lead to increased activity of the sympathetic nervous system from acute termination of analgesia. Consequently, patients may develop hypertension, dysrhythmias, and pulmonary edema.
- Flumazenil is a benzodiazepine antagonist that should be administered (0.2 mg IV over 15 seconds, then repeated every minute up to a maximum of 1 mg). Low doses of Flumazenil will reliably reverse sedation within 2 minutes, but higher doses are needed to reverse benzodiazepine-related anxiolysis. Duration of action is about 60 minutes. Side effects include nausea, vomiting, tremors, seizures, tears and dizziness. Contrary to naloxone, it does not cause hemodynamic instability.

Dosing guidelines

• *Midazolam* single dose 1 mg IV, onset of action 1-2.5 minutes, total dose 5 mg
• *Lorazapam* single dose 2 mg IV, onset of action 20-30 minutes, total dose 4 mg
• *Morphine* single dose 2-4 mg IV, onset of action 1-5 minutes, total dose 10 mg
• *Fentanyl* single dose 50 mcg IV, onset of action 1-5 min, total dose 100 mcg

FLUOROSCOPY

SYNOPSIS

The purpose of this synopsis is to provide the reader with a brief overview of fluoroscopy as it might apply to flexible bronchoscopy. It is assumed that institutions and practitioners have different biases and regulations. Herein a short summary is provided so that beginner bronchoscopists might acquire at least some of the elements necessary for a safe procedure. Readers are encouraged to follow guidelines and protocols established in their own institutions. Students are urged to read the Syllabus on Fluoroscopy and Radiation Protection created by the California Department of Health Services, which is downloadable from http://www.cdph.ca.gov/pubsforms/Guidelines/Documents/RHB-FluoroSyllabus.pdf

Definitions and consequences

- Refraction is the bending of light rays as they pass from a medium of one density to a medium of a different density. Brightness improves visual acuity
  - If the fluoroscopic image is not bright enough to be of good quality, it cannot be improved by prolonged observation.
- Visual acuity is the ability of the eye to recognized differences between two sources of light stimulus, and thus to perceive fine detail.
  - Night vision is best when the eye scans a scene (moving the fluoroscopic image).
- The eye retains any image it receives for a fraction of a second after the image is removed.
  - Frame rates of 24 frames per second (still frames as for television), will thus appear continuous, as in a movie).
- Fluoroscopy images are electromagnetic radiation waves traveling at the speed of light (186,000 miles/second). Photons have energy that is directly proportional to the frequency or inversely proportional to the wavelength of the radiation.
  - Increasing voltage increases energy and shortens the wavelength, making a more energetic and penetrating beam. The intensity of the radiation beam is influenced by current (milliAmperes mA).
- Radiation, like all energy, can be primary, scattered, or remnant. Interactions with tissues continue until all energies are spent.
  - Primary is the radiation emitted directly towards the patient, scattered is what happens when the energy collides with matter (the patient), remnant is the energy that pass through the patient and strikes the image detector.
- Scatter increases if tissue density or thickness increases, or when voltage and milliAmperage increase.
  - Compton scatter results from colliding electrons that lose their energy, as photons are scattered in all directions at low energies. Usually this is

associated with increased voltage, and will diminish the quality of the fluoroscopic image. This causes quantum mottle (a grainy appearance in the image)

- Resolution, Distortion, and Lag time
  - Definitions provided below. Move fluoroscope slowly while scanning. Keep image centered, and use highest lines/mm monitor (screen) possible.

Reducing patient exposure

- Collimate (focus) the radiation beam to the target of interest
- Use last image hold technique of fluoroscopy rather than continuous applications
- Keep patient to image intensifier (image to detector) distance as short as possible. Moving image intensifier away from the patient increases patient radiation dose.
- Use highest voltage and lowest milliAmperage as possible
- Use largest image intensifier mode (with non magnification) if possible
- Target to tabletop distance never less than 12 inches (30 cm), and should be at least 18 inches (45 cm) because patient dose decreases with increasing distance
- Use low absorption tabletops (made of aluminum, Bakelite, or carbon fiber) that do not attenuate the radiation beam.
- Use “dead-man” exposure switch (pedal) that terminates the radiation exposure when the foot is removed from the pedal. Do not provide continuous exposure.
- Doubling exposure time doubles radiation dose to both operator and patient.
- Do not use magnification mode unless absolutely necessary.

Improving visibility

- Adjust brightness and contrast settings on the screen
- Darken the procedure room lighting
- Avoid changing settings such as milliAmperage or voltage. It is better to adjust room lighting and screen properties.
- Changing the brightness setting on the screen will not improve quality of original image.
- Changing the contrast mode on the screen should be set so that bright objects of interest do not completely saturate (white out). It may be necessary to modify brightness after changing contrast modes.

Patient and operator shielding and monitoring

- Gonad shields, Thyroid shields
- Lead curtains, Body aprons
- Personal radiation film badges should be worn at collar height above the protective apron or on top of the protective apron itself.
- Badges should be checked periodically to record exposure and measure accumulated exposure over a specified period of time

Special precautions for pregnant patient and health care providers

- There is always a potential for adverse biological effects after exposure to radiation.
- Examinations should not be postponed if deemed clinically necessary, but appropriate shielding precautions should be followed.
- There is no “safe” period” for the real or potential embryo/fetus or future fertilized ovum

- Therapeutic abortion is never justified because of radiation dose to embryo/fetus during a diagnostic fluoroscopic examination
- Effects are proportional to absorbed radiation dose
- The first three months of pregnancy are when the embryo-fetus is most sensitive to radiation.
- Pregnant or potentially pregnant health care providers should not assist in fluoroscopic procedures.

Resolution, Distortion, Scattered radiation, and Lag

- Limited by screen capabilities (525 to 1000 lines/mm)
- Defined as the ability of the imaging system to differentiate small objects as separate images when they are close together.
- Distortion effects size and shape, and can be greatest at the periphery of the image.
- Lag time, and thus blurring of the image as the fluoroscope is moved, occurs because it takes a certain amount of time for the image to build on the screen.
- Scattered radiation is increased in case of high voltage, large field size and thick body parts (obesity.
- The fluoroscopist and assistants should stand as far away from the patient as possible.
- The dose of radiation received from scattered radiation by the fluoroscopist and assistants is directly proportional to the patient radiation dose.
- Preferably a 0.5 mm protective apron should be worn (transmitted exposure reduction is thus 99.9 percent, as compared to 97% reduction for a 0.25 mm apron). Aprons cover only 80% of active bone marrow of the body.

Basic operational procedures

- Use short looks rather than continuous observation. Because the recognition time of the human eye is 0.2 seconds, a short look will accomplish the same as continuous observation.
- Use a resettable timer that will alarm when a maximum of 5 minutes exposure time is reached.
- Use best contrast (lowest milliAmperage) and highest peak voltage possible.
- Keep target area small and focused, but without magnification mode.
- Maintain radiation dose as low as possible (should be less than 5 rads per minute)
- Use last frame hold strategy to keep an image on screen without additional radiation exposure.
- Place image intensifier as close to the patient as possible.
- Prevent patient motion by giving clear instructions.
- Reduce extraneous light in procedure room.
- Use gonad shields and protective aprons of at least 0.25 mm lead equivalent.
- Use audible indicator (beeper alert) when fluoroscopy is on.
- Use personal radiation dose monitoring devices (radiation badge) according to institutional guidelines.

Section 4

Bronchoscopy Step-by-Step

The Bronchoscopy Step-by-Step exercises were inspired by Arthur Murray's dance education principles. The most complex dance sequences, when broken down into numbered steps, can be learned step-by-step. Gradually, the steps are combined, and the moves finessed, until an elegant dance can be performed. Bach's Goldberg variations, all 30, are some of the most difficult to master pieces written for harpsichord and piano. No pianist learned them all together; but with patience, they can be mastered note by note by note. To become a good tennis player, one cannot master the forehand, backhand, serve, volley, smash and all other strokes at the same time; separately and repeatedly, the different strokes are practiced and then combined to play a beautiful game.

What these examples have in common is:

- *Systematic Approach:* Deconstructing complex tasks into constituent elements

- *Development of Muscle Memory:* Motor learning through the sub-conscious process of improving motor skills, smoothness and accuracy of movements, thus creating maximum efficiency and economy of movement. The major prerequisite for development of muscle memory is *repeated, deliberate practice.*

- *Development of Spatial Awareness:* To learn to flow in space, always occupying the desired position. In bronchoscopy, this additionally requires the accurate identification of airway anatomy.

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Bronchoscopy Step-by-Step

All exercises are done while observing basic principles. Optimum hand position and posture should be maintained at all times. The bronchoscope should be kept midline, minimizing white-out and red-out. The airway wall should be respected and trauma avoided. Steps should be practiced while standing both at the "patient's" head and side. It is best that practice be done initially on inanimate models and/or a virtual reality (VR) simulator.

Remember: Decision; Intent; Control; Confidence; Economy of Movement.

Step 1: Practice advancing from the nares or oral cavity (through a bite block) to the larynx. Identify structures as you proceed: nasal turbinates, hard and soft palate, uvula, posterior tongue, valecula, epiglottis and frenulum, ariepylglottic folds and arythenoid cartilages, false and true vocal cords separated by the vestibule. Assess the movement and symmetry of the vocal cords upon tidal and deep respiration and phonation.

Step 2: Practice delivery of topical anesthetic (lidocaine) in small 1-2 ml. aliquots until anesthesia has been achieved. Observing the timing of breathing, during maximum abduction of the vocal cords, proceed beyond the vocal cords into the subglottic space (the widest point is usually near the posterior commisure). Examine the subglottic space while passing through the subgottic funnel, beyond the thyroid and cricoids cartilages, and the first tracheal ring. Stopping in the subglottis is uncomfortable, and induces cough and should be avoided.

Step 3: Navigate from the subglottis, following the tracheal curve, to the carina. Repeat up and down many times.

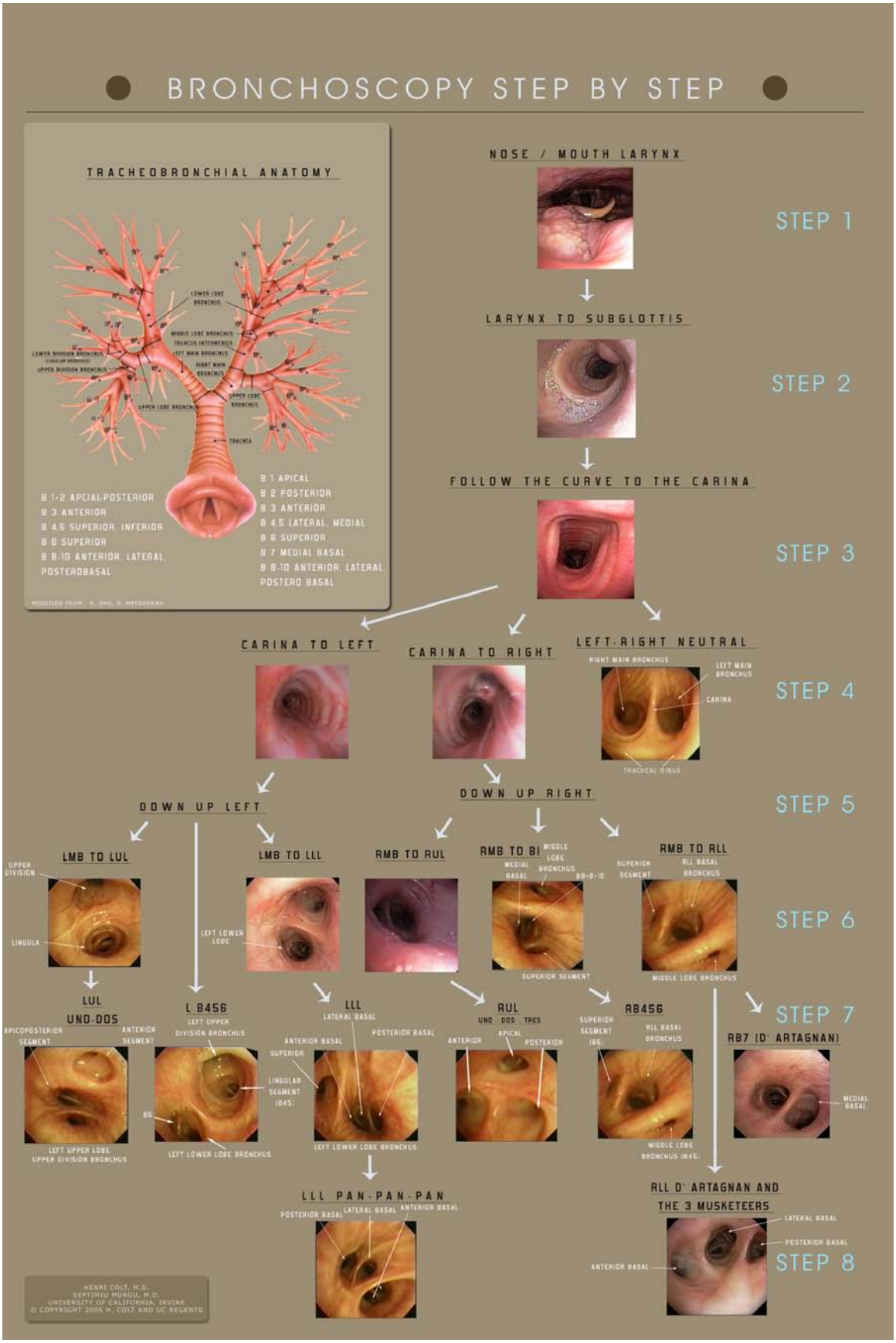
Step 4: Turn from the neutral position at the carina to the left, then back to the neutral position. Repeat many times. Then, turn from the neutral position at the carina to the right, then back to the neutral position. Repeat many times. Then practice doing each exercise both possible ways ("forward" and backward"). Then do the two exercises intermittently, one to the left, then to the right, then to the left, and so on. Then shuffle the exercises randomly, left and right and forward and backward.

Step 5: Turn from the neutral position at the carina to the left, down to the end of the LMB, and back up to neutral position at the carina. Do this exercise both possible ways ("forward" and backward"). Repeat many times. Then, turn from the neutral position at the carina to the right, down to the end of the RMB, then down the BI, and back up to neutral position at the carina. Do this exercise both possible ways ("forward" and backward"). Repeat many times. Then do the two exercises intermittently, one to the left, then to the right, then to the left, and so on. Then shuffle the exercises randomly, left and right and forward and backward.

Step 6: From the carina, follow the LMB, entering the two lobar bronchi (LLL and LUL) and return back to the LMB and carina. Repeat several times. Then, from the carina, follow the RMB and BI, entering the three lobar bronchi (RML, RLL, and RUL) and return back to the RMB and carina. Repeat several times.

Steps 7 & 8: On the left, from the LMB, enter the LLL, first the Sup segment, then the basilar pyramid (Ant, Lat, Post). Then, from the LMB, enter the LUL, then each of the two divisions (Upper Div and Lingula), then each segment (Ant, Apic-Post, Sup-Ling, Inf-Ling). Then, perform the B-4-5-6 exercise, entering the Sup and Inf segments of the Lingula, followed by the Sup segment of the LLL. On the right, from the RMB, follow the BI to the RML, and enter both segments of the RML (Med, Lat). Then, enter the RLL, first the Sup segment, then the basilar pyramid (Med, Ant, Lat, Post). Then, perform the B-4-5-6 exercise, entering the Med and Lat segments of the RML, followed by the Sup segment of the RLL. Follow the BI up and enter the RUL, entering all three segments (Ant, Post, Apic). Shuffle left and right exercises.

You are now ready to perform a complete flexible bronchoscopy. Remember, there is usually no need to enter a segment more than once.


BRONCHOSCOPY STEP BY STEP
TRACHEOBRONCHIAL ANATOMY
B 1+2 APICAL-POSTERIOR
B 3 ANTERIOR
B 4 5 SUPERIOR, INFERIOR
B 6 SUPERIOR
B 8-10 ANTERIOR, LATERAL, POSTEROBASAL
B 1 APICAL
B 2 POSTERIOR
B 3 ANTERIOR
B 4 5 LATERAL, MEDIAL
B 6 SUPERIOR
B 7 MEDIAL BASAL
B 8-10 ANTERIOR, LATERAL POSTERO BASAL
NOSE / MOUTH LARYNX
STEP 1
LARYNX TO SUBGLOTTIS
STEP 2
FOLLOW THE CURVE TO THE CARINA
STEP 3
CARINA TO LEFT
CARINA TO RIGHT
LEFT-RIGHT NEUTRAL
RIGHT MAIN BRONCHUS
LEFT MAIN BRONCHUS
CARINA
TRACHEAL RINGS
STEP 4
DOWN UP LEFT
DOWN UP RIGHT
STEP 5
LMB TO LUL
UPPER DIVISION
LINGULA
LMB TO LLL
LEFT LOWER LOBE
RMB TO RUL
RMB TO BI
MIDDLE LOBE BRONCHUS
MEDIAL BASAL
B8-9-10
SUPERIOR SEGMENT
RMB TO RLL
SUPERIOR SEGMENT
RLL BASAL BRONCHUS
MIDDLE LOBE BRONCHUS
STEP 6
LUL
UNO-DOS
APICOPOSTERIOR SEGMENT
ANTERIOR SEGMENT
LEFT UPPER LOBE UPPER DIVISION BRONCHUS
L B456
LEFT UPPER DIVISION BRONCHUS
LINGULAR SEGMENT (B4 5)
B6
LEFT LOWER LOBE BRONCHUS
LLL
LATERAL BASAL
ANTERIOR BASAL
POSTERIOR BASAL
SUPERIOR
LEFT LOWER LOBE BRONCHUS
RUL
UNO DOS TRES
ANTERIOR
APICAL
POSTERIOR
RB456
SUPERIOR SEGMENT (B6)
RLL BASAL BRONCHUS
MIDDLE LOBE BRONCHUS (B4 5)
RB7 (D' ARTAGNAN)
MEDIAL BASAL
STEP 7
LLL PAN-PAN-PAN
POSTERIOR BASAL
LATERAL BASAL
ANTERIOR BASAL
RLL D' ARTAGNAN AND THE 3 MUSKETEERS
LATERAL BASAL
POSTERIOR BASAL
ANTERIOR BASAL
STEP 8
HENRI COLT, M.D.
SEPTIMIU MURGU, M.D.
UNIVERSITY OF CALIFORNIA, IRVINE
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Section 5

Simulation Workshops

A series of *simulation workshops* that include:

- An i*nformed consent-patient safety-procedural pause simulation* with use of universal, droplet, and airborne pathogens precautions [Sample provided]
- A *flexible bronchoscopy inspection with BAL, biopsy and brushing simulation*, using inanimate models and/or high-fidelity computer-based virtual reality simulator
- A *flexible bronchoscopy with TBLB and/or TBNA simulation*, using inanimate models and/or high-fidelity computer-based virtual reality simulator

* Checklists and assessment tools used at the discretion of program director.

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User Instructions

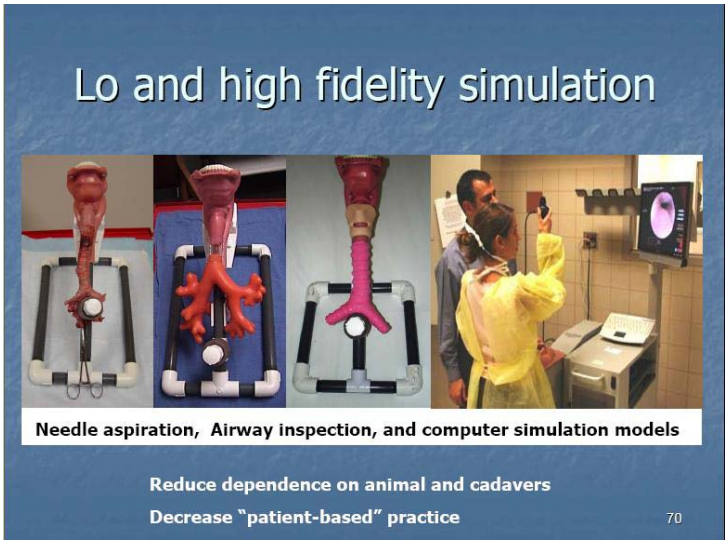
Simulation workshops

The purpose of these workshops is for students to practice skills pertaining to flexible bronchoscopy without endangering or causing undue emotional or physical discomfort to patients. Using a combination of patient models, affordable low-fidelity case-based simulation, computer-based high-fidelity simulation, and interactive discussions and debriefing sessions, trainees and instructors work together to build a mutually productive educational environment consistent with the needs outlined in the ACGME Outcome Project.

Various assessment tools and *ten-point checklists* are used to document knowledge and skill acquisition in accordance with the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

Case-based scenarios can be created by each training program, or scenarios already developed and tested can be used (some are downloadable from the Bronchoscopy.org website). Airway models, many of which are already being used internationally, can be purchased from organizations such as the American Association for Bronchology and Interventional Pulmonology and the Foundation for the Advancement of Medicine a (501-C3 nonprofit organization), as well as from private companies. Some can be loaned to institutions for specific courses.

Examples of Simulation Models



Training Program

Informed Consent, Patient Safety, Procedural Time-Out

Learning materials (Items 1-6 should be reviewed prior to workshop participation)

1. Informed consent/research and procedures: read the essay from The Picture of Health: Medical ethics and the movies (Oxford University Press). View film clip from *Extreme Measures*.

2. Informed consent/competence and capacity: read the essay from The Picture of Health: Medical ethics and the movies (Oxford University Press). View film clip from *A Beautiful Mind*.

3. Simulation session: read case descriptions, debriefing and concepts.

4. Read the manuscript *Psychological Aspects of Flexible Bronchoscopy* (by Colt, Goldman, Edell, and Knippa).

5. Read *Medical Informed Consent: general considerations for physicians* (by Patrick et al).

6. Read the text abstracted from *Institute for Clinical Systems Improvement* (ICSI) *Guidelines for safe site invasive procedures non-operating room*, downloaded from http://www.icsi.org/ January 2010.

7. Read the text abstracted from Center for Disease Control *CDC Universal Precautions* downloaded from cdc.gov January 2010.

8. Participation in group session simulation workshop (duration 90 minutes) during which materials are reviewed and case-based simulations pertaining to informed consent, patient safety, and procedural pause are performed.

9. Interactive session with critical review of scene from the film *Death of Mr. Lazarescu.*

10. Interactive session (one-on-one assessment) with instructor for scoring and feedback purposes.

INFORMED CONSENT, PATIENT SAFETY, and PROCEDURAL PAUSE (Time-Out)*

Case Information

Part 1: Demographics

Case Title: Informed Consent, Patient Safety, Procedural Pause (Time Out)

Subject Name: (1) Janette Lee (2) Beatrice Woods (3) John Jackson

Scenario Name: Informed consent-patient safety-procedural pause

Simulation Developer(s): H. Colt

Date(s) of Development: January 2010

Appropriate for following learning groups

Post graduate education
Residents
Specialties: Pulmonary Anesthesiology Surgery Critical Care
Medical Students

Simulated patients 3 scenarios

Scenario # 1 (10 minutes, with 10 minutes debriefing): Obtain informed consent for flexible bronchoscopy from patient's wife. The patient has suspected left main bronchial obstruction. He is intubated and mechanically ventilated.

Scenario # 2: (10 minutes, with 10 minutes debriefing): Identify important elements of history and physical in a patient with tracheal stenosis and stridor being evaluated for flexible bronchoscopy and possible subsequent referral for bronchoscopic intervention (dilation, laser, stent insertion) or open surgery.

Scenario # 3: (10 minutes with 10 minutes debriefing): Review all of the elements of a Procedural Pause (Time Out) for a patient with AIDS, hemoptysis, left upper lobe infiltrate and suspected infectious lung disease about to undergo flexible bronchoscopy with bronchoalveolar lavage, brushing and transbronchial biopsy of the left upper lobe.

Scenario description: The instructor will read the scenario to the team. A specially trained patient educator will be the subject of the simulation. A team member will be designated to lead the simulation, and together with other team members, the team will proceed to perform each of the scenarios with guidance and specific instruction from the instructor. It is assumed that approximately ten minutes will be devoted to each scenario, with 10 minutes for an instructor-led debriefing. The instructor may choose to perform a ten minutes debriefing after moving the team through each of the three scenarios.

* Template for Simulation Patient. Design Modified from original template by *Jeffrey M. Taekman, M.D, Duke University Simulation and Patient Safety Center*

Part 2: Curricular Information

Educational Rationale:

There has been little or no emphasis on methods for obtaining informed consent for interventional pulmonary procedures, including flexible bronchoscopy. We believe that developing and applying guidelines for informed consent is necessary in view of the increasing number and complexity of interventional procedures to ensure that specific information about each procedure, as well as benefits, potential complications, and alternatives are shared with the patient. In addition, in an environment that respects cultural diversity, this information should be shared in respect with patient-defined goals, values and priorities, including participation of family members, when desired or warranted, in the information sharing and decision-making process.

Morbidity and mortality from medical errors is a growing concern for the public, and for healthcare professionals. Patient safety has become of outmost importance, especially in regards to interventional pulmonary diagnostic and therapeutic procedures, where, at least in the United States, where the legal system does not consider interventional pulmonologists to be practicing potentially dangerous or life-threatening procedures. Patient safety also includes knowledge and performance of the procedural pause, now mandatory in the Unites States in both the bronchoscopy suite and the operating room theater. We believe that it is possible to implement greater patient safety measures if bronchoscopists were regularly informed and instructed about these patient safety practices.

Learning Objectives:

- The learner should be able to characterize the informed consent process according to accepted criteria
- The learner should be able to characterize the informed consent process in the setting of an emergency airway procedure where interaction is only possible with a family member.
- The learner should be able to identify specific questions while obtaining the patient's history that help to ensure patient safety.
- The learner should be able to enumerate the elements of a procedural pause and lead the bronchoscopy healthcare team in a "time-out."

Guided Study Questions:

- What are the key elements of informed consent?
- In respect for cultural diversity, what elements should be taken into consideration?
- What key elements of the patient history are important for enhancing patient safety during an interventional diagnostic or therapeutic pulmonary procedure?
- What are the key elements of the procedural pause? Why is such a "time out" necessary?

References (in addition to those provided for this session)

- Braddock CH et al, How doctors and patients discuss routine clinical decisions. J. Gen Intern Med 1997;12:339-345
- Etchells E et al. Patient safety in surgery: error detection and prevention. World J Surg 2003;27:936-942.
- Colt HG. Functional evaluation before and after interventional bronchoscopy. In, Interventional Bronchoscopy, Prog Resp Research 2000; 30:55-65, Karger Eds.

- Joint Commission for the Accreditation of Healthcare Organizations. National Patient Safety Goals, 2006.
- ICSI Guidelines safe site invasive procedures non-operating room. Available from

  http://www.guideline.gov/summary/summary.aspx?ss=15&doc_id=13702 from

Didactics:

- Not applicable

Assessment Instruments:

- Informed consent checklist
- Procedural pause checklist
- Patient safety and procedure-related precautions checklist

Part 3: Preparation

Monitors Required:

Not applicable

Other equipment required:

Not applicable

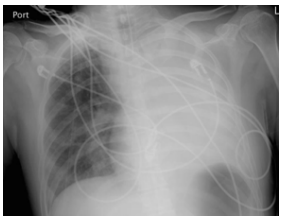
Time Duration

For each scenario

Set-up	5 minutes
Preparation	2 minutes
Simulation	10 minutes
Debrief	10 minutes

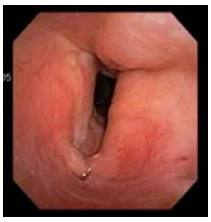
Part 4: Supporting Files (case scenario handouts)

Scenario # 1 (Informed consent): A 60 year Korean old male with severe emphysema and a history of increasing shortness of breath, cough and weight loss has been hospitalized emergently with hypoxemia and respiratory failure. He is intubated and mechanically ventilated. Chest radiograph reveals opacification of the left hemithorax with ipsilateral shift of the mediastinum.



You must obtain informed consent from the patient's wife for flexible bronchoscopy in order to determine the cause for this radiographic finding.

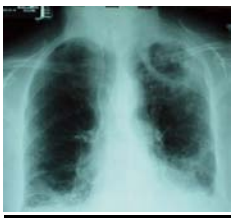
Scenario # 2 (Patient safety): A 42 year old African-American woman with increasing shortness of breath and a history of healed tracheotomy and severe rheumatoid arthritis is now admitted with stridor and cough. Three months earlier, bronchoscopy had revealed airway narrowing but the patient chose to do nothing.



In addition to obtaining informed consent, you must identify elements from the history that will help assure patient safety during and after the procedure.

Scenario # 3 (Procedural pause): A 30 year old male patient with AIDS, hemoptysis, left upper lobe infiltrate and suspected infectious lung disease is about to undergo flexible bronchoscopy with bronchoalveolar lavage, brushing and transbronchial biopsy of the left upper lobe.

In addition to the procedural pause, you must identify procedure-related elements such as universal precautions, droplet precautions, and airborne pathogen precautions instituted, before, during and after the procedure.



Part 5: Debriefing

Scenario # 1: Informed Consent

Elements of informed decision making include: (1) discussion of the clinical issue, (2) description of the procedure, (3) discussion of the risks and potential benefits of the procedure, (4) discussion of the therapeutic alternatives, and potential consequences from choosing those alternatives, (5) discussion of the implications of declining treatment, (6) assessment of the patient's and/or family member's understanding, (7) discussion of the uncertainties associated with the decision, and (8) asking the patient and family to express a preference.

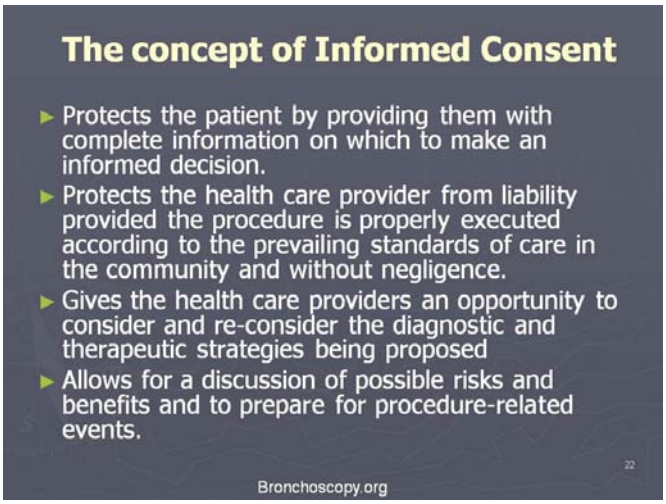
Scenario # 2: Patient Safety and Procedure-Related Precautions

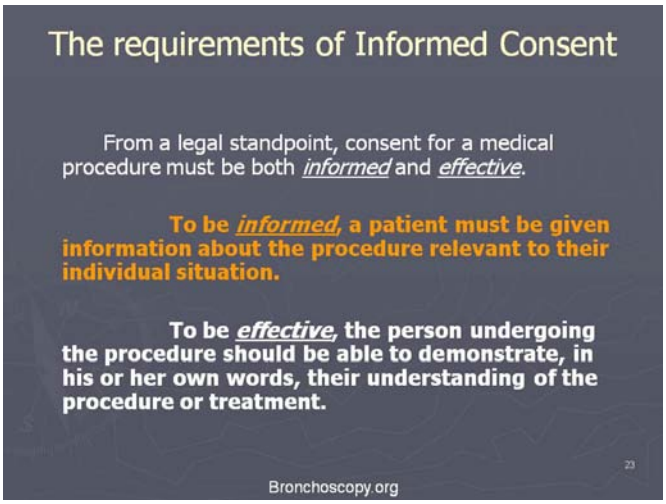
Elements crucial to safe bronchoscopic intervention and follow-up include (1) review of medical history such as COPD, pulmonary embolus, deep venous thrombosis, rheumatoid arthritis, ankylosing spondylitis , infectious lung disease, other illnesses potentially affecting the airway, cardiac disease, pacemaker, coronary artery disease, obstructive sleep apnea, CO2 retention, laryngospasm or bronchospasm, asthma; (2) review of surgical history such as neck surgery, lung surgery, spine surgery; (3) dentures or loose teeth that might interfere with appropriate response to procedure-related complications; (4) bleeding disorder; (5) allergies to medications including local anesthetics, antibiotics, or reactions to general anesthetic drugs; (6) medication usage including anticoagulation, antiplatelet agents or clopidogrel (Plavix); (7) living situation and family or friend support system; (8) proximity to medical center and physician services; (9) pregnancy; (10) inquiry regarding advanced directives and health care decision making. (12) Universal precautions should always be used to protect the patient and the health care team from spread of blood borne infections such as Hepatitis and HIV. (13) Droplet precautions are warranted in case of risk for infectious lung disease which are droplet-transmitted (14) Airborne pathogens precautions are warranted in selected cases, especially in case of suspicion for tuberculosis or influenza. (15) Resuscitation cart must always be readily available, a regularly checked and restocked.

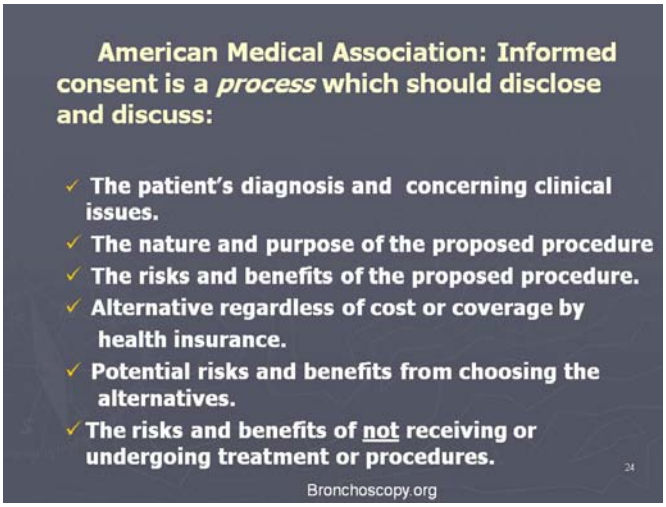
Scenario # 3: Procedural Pause (Time-Out)

The procedural pause is performed immediately prior to the start of a procedure and must include specific elements to assure patient safety and avoid wrong procedure-wrong site-wrong patient events. A visual memory (triggers) is helpful to assure that all elements are addressed. These include (1) verification of patient, (2) verification of procedure, (3) verification of site and side, (4) verification of consistency with signed informed consent, (5) verification of availability of medical records and equipment, (6) declaration of need for medication or fluids, (7) description of allergies, drug reactions, (8) declaration and communication regarding other safety concerns. Initiated by the team leader, a verbal acknowledgement is required by all members of the health care team. During the time-out, each person in the room should stop what they are doing and actively participate in the process. No individual is exempt, and active participation requires that each individual state clearly that they agree with the elements of the time-out. Any discrepancies and disagreements must be addressed before the procedure is begun. If any distractions occur during the time-out, such as if another individual enters the room or a telephone rings, the time-out must be restarted.

Concepts: Informed consent







Concepts: Patient Safety and procedure-related precautions

History, Risk factors, and Universal precautions

1. Medical history such as COPD, pulmonary embolus, deep venous thrombosis, rheumatoid arthritis, ankylosing spondylitis , infectious lung disease or other illnesses potentially affecting the airway, cardiac disease, pacemaker, coronary artery disease, obstructive sleep apnea, CO2 retention, laryngospasm or bronchospasm, asthma.
2. Surgical history such as neck surgery, lung surgery, spine surgery;
3. Dentures or loose teeth that might interfere with appropriate response to procedure-related complications
4. Bleeding disorder
5. Allergies to medications including local anesthetics, antibiotics, or reactions to general anesthetic drugs
6. Medication usage including anticoagulation, antiplatelet agents or Clopidogrel
7. Living situation and family or friend support system
8. Proximity to medical center and physician services
9. Pregnancy
10. Inquiry regarding advanced directives and health care decision making.
11. Universal precautions should always be used to protect the patient and the health care team from spread of blood borne infections such as Hepatitis and HIV.
12. Gloves, Hand-washing, Gowns, Surface disinfection, Sharp containers

1

Droplet precautions

- Droplet precautions are warranted in patients known or suspected to be infected with microorganisms transmitted by droplets (larger than 5 microns in size) that can be generated by coughing, sneezing, talking, or during the procedure.
  - Surgical masks, facial shield, or goggles
  - patient transport precautions
  - Droplet precaution sign on procedure room door
  - Cough/respiratory hygiene etiquette

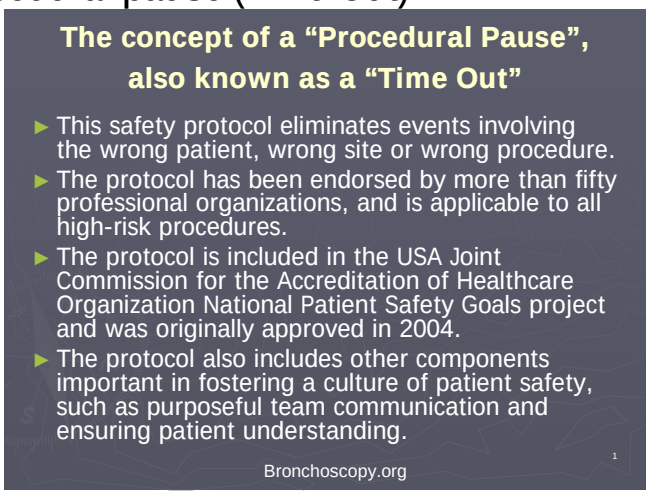
2

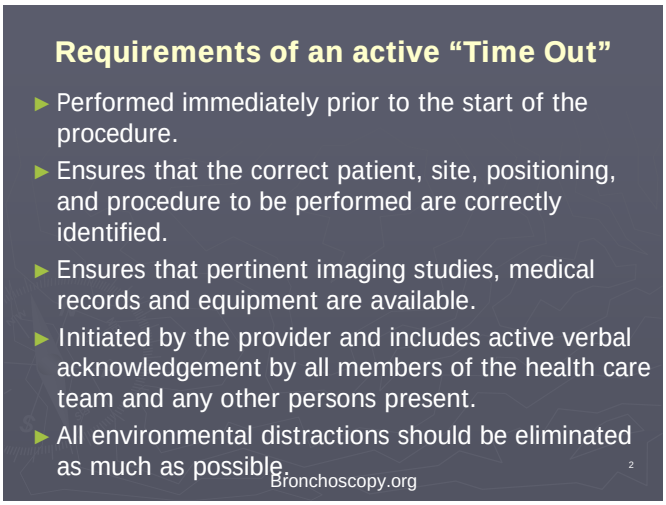
Airborne pathogens precautions

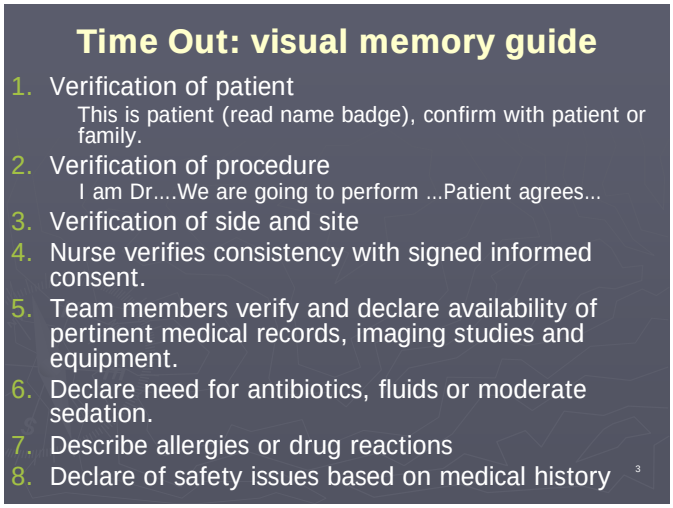
- Hand hygiene
- Cough/respiratory hygiene etiquette
- Cleaning and disinfection of contaminated surfaces
- Negative airflow with external exhaust
- N-95 respiratory or other National Institute for Occupational Safety and Health recommended device.
- Power air purifying respiratory (PAPR) might be considered in selected high risk cases.
- Airborne precautions sign

3

Concepts: Procedural pause (Time-Out)







Section 6

Observed Real-Patient Scenarios

A series of *observed real-patient scenarios* that include:

- An *informed consent, patient safety, procedural pause* scenario.
- A *flexible bronchoscopy inspection with BAL, brushing and biopsy* scenario.
- A *flexible bronchoscopy with TBLB and/or TBNA* scenario.

* Checklists and assessment tools used at the discretion of program director.

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User Instructions

Real patient observations

The purpose of real patient observations is to allow the instructor to assess the student in the clinical setting. This is similar to how medical students and other house officers are observed and judged prior to being deemed competent to perform a physical examination or certain procedures.

Various assessment tools and ten-point checklists are used to document knowledge and skill acquisition in accordance with elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

It is assumed that students will be observed throughout their subspecialty training, and that specific instances may be chosen for assessment purposes. The frequency of such assessments is still undetermined, but the purpose is to be able to monitor the student's progression along the learning curve, so that instructors might be able to provide constructive feedback and advice, in addition to knowledge and technical expertise.

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Section 7

Practical Approach Sessions

A series of interactive (instructor-student)
Practical Approach to Procedural Decision-making workshops

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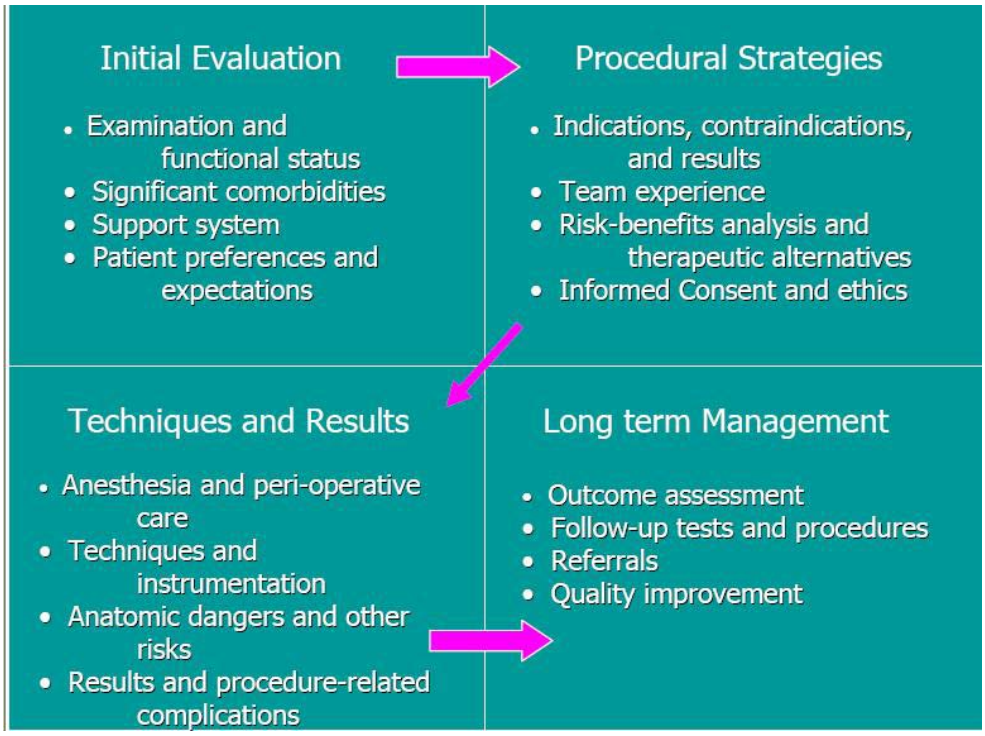
User Instructions

Practical Approach workshops

The purpose of these practical approach sessions is to help learners think through the decision making process. Often, instructors will use a practical approach to help students gain insights into the strategy and planning, technical performance, and response to complications elements of a minimally invasive procedure.

These exercises are done orally, and the assessment is subjective, based on the instructor's perception of how the learner responds to questions and outlines a procedural strategy. Learners should be taught to use scientific evidence as well as expert opinion to formulate plans and achieve desired results. A dialogue is thus engendered between instructor and student in order to address alternatives and differences in technique, as well as expected outcomes.

It is expected that sessions should last no more than 30 minutes. The student may be given a scenario, and using a model of the four box approach the student might be asked to address each of the four boxes, with specific emphasis on one or two items based on instructor preference. Numerous exercises are available on the Bronchoscopy.org website to serve as examples, but any scenario the instructor chooses or devises can be used for teaching purposes.



The Practical Approach© is an interactive learning program:

- The purpose of *The Practical Approach* is to help learners gain the cognitive, technical, experiential, and affective skills necessary to perform bronchoscopy. Competency is sought in the three major elements of a procedure; strategy and planning, execution, and response to procedure-related adverse events or complications.

- Using a four box approach inspired from Albert Jonsen's[1] classic work in medical ethics, learners rationalize various components of the decision making process.
  - By working through case scenarios, learners are prompted to think about the how and why of their actions, based on background information, pertinent literature, and experience.
  - Consistent with the ACGME professionalism competency guides [2, 3], case scenarios prompt learners to address various components of the informed consent process, and discuss outcomes based on possible as well as real results.

- *The Practical Approach* helps learners become competent bronchoscopists according to current recommendations set forth by the American College of Graduate Medical Education [4] whereby trainees learn to:
  - Gather essential and accurate information about their patients.
  - Make informed decisions about diagnostic and therapeutic interventions based on patient information and preferences, up-to-date scientific evidence and clinical judgment.
  - Use information technology to support patient care decisions and patient education.
  - Develop patient management plans.
  - Counsel and educate patients and their families.
  - Communicate effectively and demonstrate caring and respectful behaviors when interacting with patients and their families.
  - Provide healthcare services aimed at preventing health problems or maintaining health.
  - Work with healthcare professionals, including those from other disciplines to provide patient-focused care.

References

1. Jonsen AR, Siegler M, Winslade WJ. Clinical Ethics. 6th Ed, McGraw Hill, NY 2006.
2. ACGME Web site:http//www.acgme.org/outcome/comp/compfull.asp
3. Apelgren K. ACGME e-Bulletin. August 2006
4. ACGME Competencies at http://www.acgme.org

PRACTICAL APPROACH MODULE

Example of a Practical Approach to Interventional Bronchoscopy Procedural Decision Making:
Scenario # 13: Flexible bronchoscopy with BAL in suspected pulmonary lymphangitic carcinomatosis, and informed consent in a deaf person
[Abstracted from: Bronchoscopy.org]

Based on the information presented below, please describe your procedural decision making using The Practical Approach to Procedural Decision making. Do your best to complete each item of the Four Boxes. If the case scenario contains no information pertaining to an item, please address it as NOT AVAILABLE. Note that each case scenario may have greater emphasis on one or more items listed in the "Practical Approach".

MM is a 72 year old man with stage IV adenocarcinoma of the lung admitted for progressive dyspnea. He has undergone multiple chemotherapy regimens. Four months before admission he was started on tyrosine kinase inhibitors. He has increasing shortness of breath, fatigue, dry cough, and weight loss for several weeks. He also has COPD with FEV1 35% predicted and is deaf. He lives with his 33 year old son. The patient's Karnofsky status is 50.

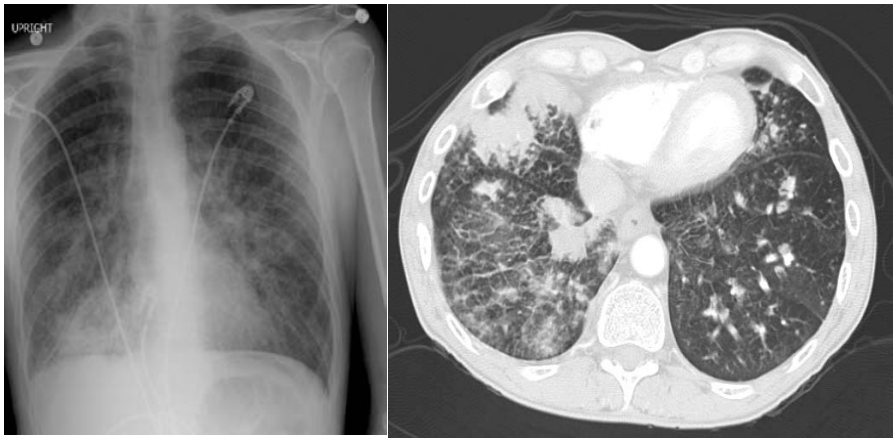
Chest radiograph shows diffuse bilateral interstitial infiltrates and an ill-defined opacity at the right lung base. Computed tomography scan reveals intralobular septal thickening and consolidation in the right middle lobe which was the site of the primary tumor.

Physical examination reveals a temperature of 37.6 blood pressure 112/74 pulse 92 respiratory rate 22 and SaO2 91% on Room Air. He is in no acute distress but is ill-appearing and cachectic. His examination is normal except for diffuse bilateral crackles with decreased breath sounds at the right base and evidence of digital clubbing.

Laboratory findings reveal: Sodium 136; BUN 33; Creatinine 1.7; Glucose 124; CBC showing WBC 12.3, Neutrophil 78% with no bands, Hemoglobin 13.3, and Platelets 163,000. Blood cultures are negative; urinalysis is negative; sputum gram stain is negative (cultures are pending).

The oncology team has formulated a differential diagnosis that includes lymphangitic carcinomatosis, pulmonary infection, and drug-related pneumonitis.

Pulmonary consultation is requested for bronchoscopy.



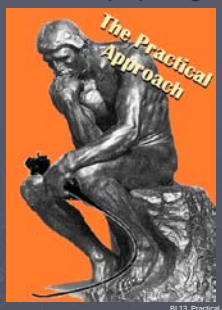
After addressing items of the four boxes, please consider the following:

- Identify radiographic characteristics of pulmonary lymphangitic carcinomatosis.
- Define the role of bronchoalveolar lavage and transbronchial lung biopsy in the diagnosis of lymphangitic spread.
- Identify possible ways of obtaining informed consent from a deaf person.

Initial Evaluation	**Procedural Strategies**
1. Physical examination, complementary tests, and functional status assessment 2. Patient's significant co-morbidities 3. patient's support system (also includes family) 4. Patient preferences and expectations (also includes family)	1. Indications, contraindications, and expected results 2. Operator and team experience and expertise 3. Risk-benefits analysis and therapeutic alternatives 4. Respect for persons (Informed Consent)
Procedural Techniques and results	**Long term Management Plan**
1. Anesthesia and other perioperative care 2. Techniques and instrumentation 3. Anatomic dangers and other risks 4. Results and procedure-related complications	2. Outcome assessment 3. Follow-up tests, visits, and procedures 4. Referrals to medical, surgical, or palliative/end of life subspecialty care 5. Quality improvement and team evaluation of clinical encounter

Slide 1

Bronchoscopy for suspected pulmonary lymphangitic carcinomatosis



- Learning Objectives
  - To identify radiographic characteristics of pulmonary lymphangitic carcinomatosis.
  - To define the role of bronchoalveolar lavage and transbronchial lung biopsy for diagnosis of lymphangitic spread.
  - To identify ways of obtaining informed consent from a deaf person.

BI 13. Practical Approach Lymphangitic spread 1

Slide 2

Case description

- G.G. is a 72 year old man with stage IV adenocarcinoma of the lung admitted for progressive dyspnea. He has undergone multiple chemotherapy regimens. Four months before admission he was started on tyrosine kinase inhibitors. He has increasing shortness of breath, fatigue, dry cough, and weight loss for several weeks. The patient has COPD with FEV_1 35% predicted and is deaf. He lives with his 33 year old son. Karnoksky status is 50.
- Chest radiograph shows diffuse bilateral interstitial infiltrates and an ill-defined opacity at the right lung base. Computed tomography scan reveals intralobular septal thickening and consolidation in the right middle lobe which was the site of the primary tumor. The oncology team has formulated a differential diagnosis that includes lymphangitic carcinomatosis, pulmonary infection, and drug-related pneumonitis. Pulmonary consultation is requested for bronchoscopy

BI 13. Practical Approach Lymphangitic spread 2

Slide 3

The Practical Approach

Initial Evaluation	Procedural Strategies
• Examination and, functional status • Significant comorbidities • Support system • Patient preferences and expectations	• Indications, contraindications, and results • Team experience • Risk-benefits analysis and therapeutic alternatives • Informed Consent
Techniques and Results	**Long term Management**
• Anesthesia and peri-operative care • Techniques and instrumentation • Anatomic dangers and other risks • Results and procedure-related complications	• Outcome assessment • Follow-up tests and procedures • Referrals • Quality improvement

3

Slide 4

Initial Evaluation

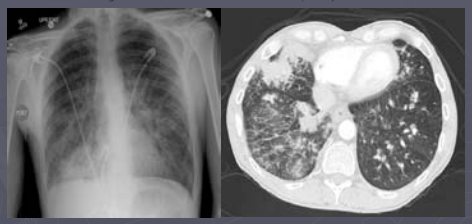
- Physical Exam
  - T 37.6 BP 112/74 P 92 R 22 SaO_2 91% RA
  - General: NAD but ill-appearing, A&Ox4, cachectic
  - HEENT: PERRLA, sclera anicteric, no neck LAD
  - Chest: diffuse bilateral crackles with decreased BS at right lung base, no wheezing
  - Heart: RRNR S_1 S_2 no murmur
  - Abd: soft, NT, ND, normoactive BS
  - Ext: +digital clubbing, no edema or cyanosis
- Labs
  - Chem panel: Na+ 136 BUN 33 Crt 1.7 Glu 124
  - CBC: WBC 12.3 Neutrophil 78% no bands Hgb 13.3 Plt 163
  - Blood cx NGTD, U/A neg, sputum cx pending (Gram stain neg)

BI 13. Practical Approach Lymphangitic spread 4

Slide 5

Initial Evaluation

- Left: chest radiograph shows diffuse bilateral interstitial infiltrates and an ill-defined opacity at the right lung base. Right: computed tomography scan reveals intralobular septal thickening and consolidation in the right middle lobe which was the site of the primary tumor.



BI 13. Practical Approach Lymphangitic spread 5

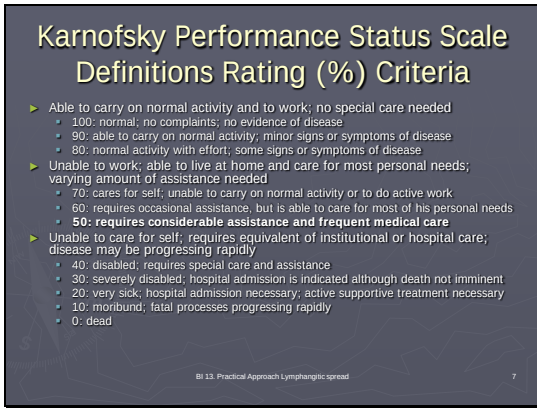
Slide 6

Initial Evaluation

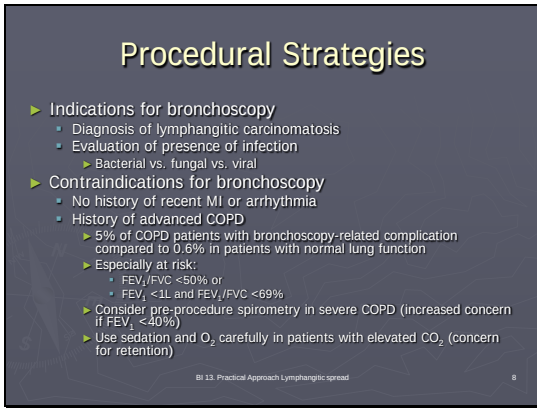
- Functional status assessment
  - Karnofsky status score 50
- Significant co-morbidities
  - Advanced COPD, HTN, chronic renal insufficiency, poor functional capacity
- Support system
  - Lives with wife, has 3 children who are supportive
- Preferences and expectations
  - Realistic and understands severity of disease

BI 13. Practical Approach Lymphangitic spread 6

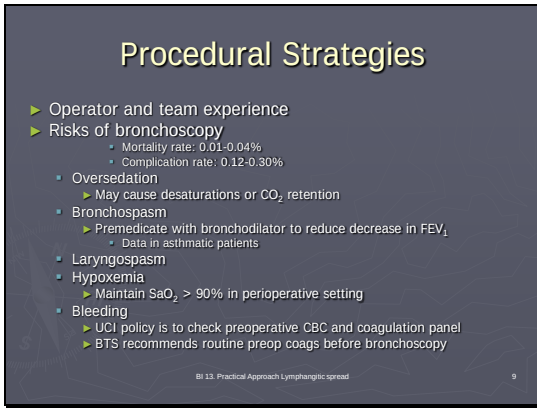
Slide 7



Slide 8



Slide 9



Slide 10

Procedural Strategies

- Informed consent for the hearing-impaired
- When deaf patients sign consent forms, they often do so without understanding them
  - Many believe forms are malpractice waivers
  - Involvement of an interpreter is indispensable
  - Allows physician to
    - Obtain thorough history and proper examination
    - Ensure that patient understands risks and benefits of procedure
    - Establish effective communication and environment of caring and trust
  - Communicate through writing when possible as opposed to lip-reading

BI 13. Practical Approach Lymphangitic spread 10

Slide 11

Procedural Techniques and Results

- Anesthesia: moderate sedation
  - Midazolam
    - Well tolerated
    - Less than 10% exhibit prolonged effect from impaired metabolism
    - Initial dose of 2 mg followed after 2 minutes by increments of 1 mg/min if needed
  - Propofol: monitor for hypotension
  - Flumazenil: benzodiazepine antagonist
    - Short elimination time allows re-sedation
    - Usual initial dosage: 250-500 micrograms
- Perioperative care
  - Continuous oxygen with monitoring
  - Preoperative bronchodilator
  - Viscous and liquid Lidocaine
- Procedure-related complications

*reference

BI 13. Practical Approach Lymphangitic spread 11

Slide 12

Long-term Management Plan

- BAL was performed and revealed malignant cells consistent with adenocarcinoma
- Diagnosis of lymphangitic carcinomatosis was discussed with patient and given poor prognosis a palliative care consult was considered
- Patient was discharged home with hospice
  - Patient and family expressed satisfaction with care and management by all subspecialty and ancillary teams

BI 13. Practical Approach Lymphangitic spread 12

Slide 13

Q 1: What are the specific CT characteristics of pulmonary lymphangitic carcinomatosis and how do they differ from those of tyrosine kinase inhibitor-induced interstitial pneumonitis?

- HRCT findings in lymphangitic carcinomatosis
  - Irregular, nodular, and/or smooth interlobular septal thickening
  - Thickening of fissures as result of involvement of lymphatics concentrated in subpleural interstitium
  - Preservation of normal parenchymal architecture at level of second pulmonary lobule
  - Peribronchovascular thickening
  - Centrilobular peribronchovascular thickening predominating over interlobular septal thickening in a minority of patients
  - Polygonal arcades or polygons with prominence of centrilobular bronchovascular bundle in association with interlobular septal thickening (50%)
  - Mediastinal and/or hilar lymphadenopathy (30-50%)
  - Pleural effusions (30-50%)
- Findings can be unilateral or bilateral and focal or diffuse

BI 13. Practical Approach Lymphangitic spread 13

Slide 14

Q 1: What are the specific CT characteristics of pulmonary lymphangitic carcinomatosis and how do they differ from those of tyrosine kinase inhibitor-induced interstitial pneumonitis?

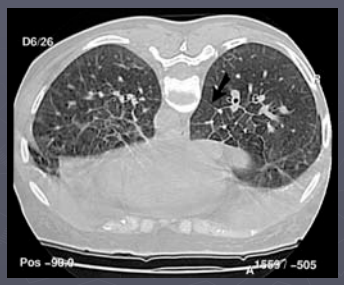
- HRCT findings in tyrosine kinase-induced interstitial pneumonitis
  - Diffuse interstitial markings and increased radiodensities
  - **Ground glass opacities**
  - Multiple centrilobular nodules
  - Focal air trapping
  - Pleural effusion
  - **Extensive fibrosis and honeycombing with traction bronchiectasis in chronic and advanced disease**

BI 13. Practical Approach Lymphangitic spread 14

Slide 15

Lymphangitic carcinomatosis

Smooth and nodular interlobular septal thickening (black arrow)

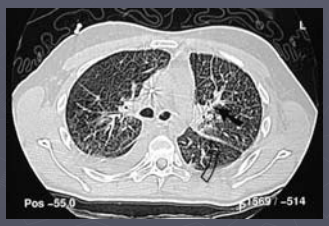


BI 13. Practical Approach Lymphangitic spread 15

Slide 16

Lymphangitic carcinomatosis

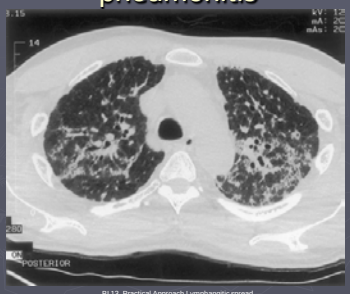
Prominent axial interstitium with thickened bronchovascular bundles (solid arrow). Also thickening of fissure secondary to involvement of subpleural lymphatics (open arrow).



BI 13. Practical Approach Lymphangitic spread 16

Slide 17

Tyrosine kinase-induced interstitial pneumonitis



BI 13. Practical Approach Lymphangitic spread 17

Slide 18

Q 2: What is the expected yield of bronchoalveolar lavage for diagnosing lymphangitic carcinomatosis, and how does this yield compare with that of transbronchial lung biopsy?

- Transbronchial lung biopsy
  - Goal is to replace more invasive open lung or transthoracic needle biopsy
  - 19 patients with diffuse interstitial disease underwent flexible bronchoscopy with transbronchial biopsy
    - Lymphangitic carcinomatosis was established in 6 (32%) of patients
      - One patient developed 30% pneumothorax which was treated with chest tube evacuation
  - The diffuse bronchial and peribronchial lymphatic involvement demonstrated suggests that TBLB should be the procedure of choice in diagnosis of lymphangitic carcinomatosis
  - Aranda C et al. Transbronchial lung biopsy in the diagnosis of lymphangitic carcinomatosis. Cancer 1978;42:1995-8.

BI 13. Practical Approach Lymphangitic spread 18

Slide 19

Q 2: What is the expected yield of bronchoalveolar lavage for diagnosing lymphangitic carcinomatosis, and how does this yield compare with that of transbronchial lung biopsy?

- Bronchoalveolar lavage
  - Retrospective analysis, 12 patients with known neoplastic disease and diffuse pulmonary infiltrates consistent with lymphangitic carcinomatosis
    - BAL correctly identified 5/5 (100%)
      - No complications
    - Bronchial washing 4/7 (57%)
    - Bronchial brushing 2/5 (40%)
    - Transbronchial lung biopsy 4/9 (44%)
      - One patient with significant pulmonary hemorrhage
  - Conclusion: BAL should be performed to confirm diagnosis before proceeding to biopsy, especially when risks of pneumothorax and hemorrhage are excessive
  - The value of bronchial washings and bronchoalveolar lavage in the diagnosis of lymphangitic carcinomatosis. Chest 1998;94:1028-30

ref.

BI 13. Practical Approach Lymphangitic spread 19

Slide 20

Q 3: Should you perform transbronchial lung biopsy in this case? If so, why? If not, why not?

- History of advanced COPD with increased concern for pneumothorax
- History of chronic renal insufficiency with concern for platelet dysfunction and increased risk of bleeding
- Evidence showing BAL as the initial test of choice in diagnosis of lymphangitic carcinomatosis
  - Consider TBLB if BAL is non-diagnostic and patient wishes to pursue further diagnosis and treatment

BI 13. Practical Approach Lymphangitic spread 20

Slide 21

Prepared with the assistance of Paul Huang M.D.

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BI 13. Practical Approach Lymphangitic spread 21

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Section 8

Proctored Bronchoscopy

Proctored patient-care in the procedural setting,
with competency assessment

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User Instructions

Proctored flexible bronchoscopy

The purpose of proctoring a procedure is to document that the student is indeed able to perform all the elements of flexible bronchoscopy independently. These include strategy and planning, technique, patient safety measures and the ability to respond appropriately to procedure-related adverse events.

A ten-point assessment tool can be used for grading purposes. The overall assessment must also include the faculty's general observations of the trainee's practices during the course of training. From an assessment perspective, this is the last item with which to "score" a trainee's ability to competently perform bronchoscopy. The intensity with which proctoring occurs, and the number of "proctored" cases that may be required within a training program is left to the program director's discretion.

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Section 9

Assessment Tools

A collection of assessment tools,
with user instructions:

- BSTAT (With and without instructions)
- BSTAT-TBLB/TBNA (With and without instructions)
- BSAT

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Scoring Recommendations for BSTAT Assessment Tools
(BSTAT, BSTAT-TBLB/TBNA)

The goal of these assessment tools is to be able to monitor a student'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 student's performance (For BSTAT tools, this could be done on a once or twice a year basis) that each of the ten elements in each tool are covered satisfactorily. Repeated testing will demonstrate increases in knowledge and technical skill acquisition as the student climbs the learning curve from novice to advanced beginner, intermediate and competent bronchoscopist for the procedure being assessed.

To maximize objective scoring, each task has been defined explicitly in this user manual for each checklist and assessment tool. Participation in specially-designed Train-the-Trainers courses being currently organized is encouraged to assist with standardization and to help instructors use this program to its fullest potential.

Scores can be plotted on a graph, and each institution/program can obviously 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 student to be judged competent to perform bronchoscopy independently. 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.

Category	**Score**
Novice	< 60
Advanced Beginner	60-79
Intermediate	80-99
Competent	100

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

Instructions: To administer the BSTAT, the trainee is asked to perform a complete diagnostic flexible bronchoscopy, while at all times stating what she is doing and where she is navigating in the airway. Thus, items 1, 2, 5, 6, and 7 are scored. She is then asked to go from the neutral position at the main carina to segments RB-4,5,6 and LB-8,9,10, and items 3 and 4 are scored. Items 8 and 9 are scored using the associated slide-show images. Finally, item 10 is scored while the trainee performs a BAL, brushing and mucosal biopsy. The BSTAT-TBLB/TBNA is also administered with a full diagnostic bronchoscopy, followed by a conventional TBNA and TBLB procedure (not necessarily all in the same patient, if assessment is being done in a patient).

Bronchoscopy Skills and Tasks Assessment Tool (BSTAT)

Student: _____ Training Year _____

Faculty _____ Date _____

Educational Item* Items 1-10 each scored separately	**Satisfactory Yes/No**
1. Identification of Right sided anatomy (2 points each, target 20 points) ☐ RB1 apical ☐RB2 posterior ☐RB3 anterior ☐RB4 medial ☐RB5 lateral ☐ RB6 superior ☐RB7 mediobasal ☐RB8 anterobasal ☐RB9 laterobasal ☐ RB10 posterobasal	Yes / No Score ____/20
2. Identification of Left sided anatomy (2 points each, target 16 points) ☐ LB1+2 apical/posterior ☐LB3 anterior ☐ LB4 superior ☐ LB5 inferior ☐ LB6 superior ☐LB8 anterobasal ☐LB9 laterobasal ☐LB10 posterobasal	Yes / No Score ____/16
3. Identify and enter RB 4+5+6 on demand (All three segments must be entered to earn 5 points, no partial points given, target 5 points) ☐ RB 4+5+6	Yes / No Score ____/5
4. Identify and enter LB 8+9+10 on demand (All three segments must be entered to earn 5 points, no partial points given, target 5 points) ☐ LB 8+9+10	Yes / No Score ____/5
5. Posture/Hand positions/Equipment safety (3 points each, target 9 points) ☐ Body posture ☐Hand positions ☐ Equipment handling	Yes / No Score ____/9
6. Scope centered and kept in midline (5 points, no partial points given) ☐ Scope centered in airway lumen	Yes / No Score ____/5
7. Airway wall trauma avoided (5 points, no partial points given) ☐ Airway wall trauma avoided	Yes / No Score ____/5
8. Nomenclature: secretions descriptions (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	Yes / No Score ____/10
9. Nomenclature: Mucosal descriptions (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	Yes / No Score ____/10
10. Tasks: (5 points each, target 15 points) ☐ BAL ☐ Mucosal biopsy ☐Brush	Yes / No Score ____/15

* The combined use of the 10 items pertains to technical skills needed to climb learning curve from novice to advanced beginner to intermediate to competent bronchoscopist able to perform flexible bronchoscopy with lavage, brushing and endobronchial biopsy independently.

FINAL GRADE PASS FAIL **SCORE** _____/100

User Instructions

Bronchoscopy Skills and Tasks Assessment Tool (BSTAT)

Educational Item* Items 1-10 each scored separately	**Satisfactory Yes/No**
1. Identification of Right sided anatomy (2 points each, target 20 points) ☐ RB1 apical ☐RB2 posterior ☐RB3 anterior ☐RB4 medial ☐RB5 lateral ☐ RB6 superior ☐RB7 mediobasal ☐RB8 anterobasal ☐RB9 laterobasal ☐ RB10 posterobasal *Each segment correctly identified AND entered scores TWO points.	Yes / No Score ____/20
2. Identification of Left sided anatomy (2 points each, target 16 points) ☐ LB1+2 apical/posterior ☐LB3 anterior ☐ LB4 superior ☐ LB5 inferior ☐ LB6 superior ☐LB8 anterobasal ☐LB9 laterobasal ☐LB10 posterobasal *Each segment correctly identified AND entered scores TWO points	Yes / No Score ____/16
3. Identify and enter RB 4+5+6 on demand (All three segments must be entered to earn 5 points, no partial points given, target 5 points) ☐ RB 4+5+6 * All THREE of these segments must be identified and entered correctly using appropriate flexion/extension of the bronchoscope in order to obtain FIVE points. No partial points are given. This is an "All or None" exercise.	Yes / No Score ____/5
4. Identify and enter LB 8+9+10 on demand (All three segments must be entered to earn 5 points, no partial points given, target 5 points) ☐ LB 8+9+10 All THREE of these segments must be identified and entered correctly using appropriate manipulation of the bronchoscope in order to obtain FIVE points. No partial points are given. This is an "All or None" exercise.	Yes / No Score ____/5
5. Posture/Hand positions/Equipment safety (3 points each, target 9 points) ☐ Body posture ☐Hand positions ☐Equipment handling *Procedures are taught different ways. In general however, students should be able to refrain from moving around the patient, they should avoid placing their hands into a patients eyes or exerting too much pressure onto a patient's head. The scope should be kept relatively straight, and should not be twisted at the insertion site. The hand holding the scope should be relaxed, and assistant should be able to easily access the hand being used to hold and manipulate accessory instruments. The bronchoscopist should be able to protect the scope from trauma (biting, slamming against a cart, dropping onto the floor). For each of the items, THREE points (or none) are given.	Yes / No Score ____/9
6. Scope centered and kept in midline (5 points, no partial points given) ☐ Scope centered in airway lumen In general, the scope should be kept centered so that it does not rub up against the airway wall. This is especially important when inserting the scope to the larynx, passing the vocal cords, and examining segmental bronchi. A scope that is not well-centered decreases overall visualization and may cause airway wall trauma or cough. If the scope is centered in the airway throughout most of the	Yes / No Score ____/5

procedure, a score of FIVE points is achieved. No partial points are given. This is an "All or None" exercise.	
7. Airway wall trauma avoided (5 points, no partial points given) ☐ Airway wall trauma avoided * In general, airway wall trauma causes erythema, swelling or cough. During the procedure, the scope should be kept "off the wall" using careful manipulation of the lateral as well as flexion/extension function of the scope and appropriate identification and entry into segmental bronchi. If airway wall trauma is avoided during most of the procedure, a score of FIVE points is achieved. No partial points are given. This is an "All or None" exercise.	Yes / No Score ____/5
8. Nomenclature: secretions descriptions (1 point each, target 10 points) ☐ Sooty-burn ☐ Bloody ☐ Necrotic debris ☐Yellow purulent ☐ White creamy ☐Normal clear ☐Tar-stained smoker's phlegm ☐ Frothy covering TE fistula ☐Pink frothy edema ☐ Scope trauma * This is a written test for which 1 point is given for each correct answer; to be used with associated slide-show.	Yes / No Score ____/10
9. Nomenclature: Mucosal descriptions (1 point each, target 10 points) ☐ Exophytic cancer ☐Necrotic tracheitis ☐Bronchial pits ☐ Chronic bronchitis ☐ Hypervascularity ☐Tumor infiltrated carina ☐ Extrinsic compression ☐Anthracosis ☐Oral candidiasis ☐Acute bronchitis *This is a written test for which 1 point is given for each correct answer; to be used with associated slide-show.	Yes / No Score ____/10
10. Tasks: (5 points each, target 15 points) ☐ BAL ☐ Mucosal biopsy ☐Brush * This is an "All or None" exercise for which FIVE points are given to each of the 3 items if performed correctly. No partial points are given within each item.	Yes / No Score ____/15

* The combined use of these 10 items pertains to technical skills needed to climb learning curve from novice to advanced beginner to intermediate to competent bronchoscopist able to perform flexible bronchoscopy with BAL, brushing and mucosal biopsy.

FINAL GRADE PASS FAIL **SCORE** _____/100

Bronchoscopy Skills and Tasks Assessment Tool, for Transbronchial Lung Biopsy and Transbronchial Needle Aspiration (BSTAT-TBLB/TBNA)

Student: _____ Training Year _____

Faculty _____ Date _____

Educational Item* Items 1-10 each scored separately	**Satisfactory Yes/No**
1. TBLB: Airway inspection without trauma (no partial points) ☐ Complete inspection done properly	Yes / No Score ____/5
2. TBLB technique (no partial points) ☐Wedge scope into target segment ☐ Visualize target with fluoroscopy ☐Advance forceps under fluoroscopy guidance to target ☐ Open forceps at target ☐Advance and close forceps at target ☐ Remove forceps from scope	Yes / No Score ____/10
3. TBLB Complications: Pneumothorax (no partial points) ☐ Perform panoramic view of hemithorax using fluoroscopy ☐Recognize signs and symptoms ☐ Demonstrate easy access to small or large bore chest tube	Yes / No Score ____/10
4. TBLB: Complications: Bleeding (no partial points) ☐ Scope wedged into target segment ☐Move patient into lateral decubitus safety position ☐ Access upper airway with oral suction ☐Demonstrate access and use of bite block and endotracheal tube	Yes / No Score ____/10
5. TBLB: Decision making (5 points each , target score 15 points) ☐ Image 1 ☐Image 2 ☐Image 3	Yes / No Score ____/15
6. TBNA: Airway inspection and imaging interpretation (5 points each) ☐ Complete inspection done properly ☐Imaging studies correctly interpreted	Yes / No Score ____/10
7. TBNA Technique - Jab (no partial points) ☐Advance catheter towards target area ☐ Advance needle to target area without airway trauma ☐ Jab needle through airway wall at target region while scope is fixed at nose or mouth ☐ Move needle back and forth inside node while suctioning ☐Release suction prior to needle withdrawal from target region ☐ Retract needle into the catheter ☐ Observe that needle is completely retracted inside catheter ☐ Withdraw catheter from scope	Yes / No Score ____/10
8. TBNA Technique-Hub against wall (no partial points) ☐Advance catheter towards target area ☐ Touch catheter to target area without airway trauma ☐ Penetrate airway wall with needle while holding scope firmly ☐Move needle back and forth inside node while suctioning ☐ Release suction prior to needle withdrawal from target region ☐ Retract needle into the catheter ☐ Observe that needle is completely retracted inside catheter ☐ Withdraw catheter from scope	Yes / No Score ____/10
9. TBNA Technique -Piggyback: (no partial points) ☐Secure catheter and scope simultaneously with one hand ☐ Advance scope and catheter as a single unit to target region ☐ Penetrate airway wall at target region ☐Move needle back and forth inside node while suctioning ☐ Release suction prior to needle withdrawal from target region ☐ Retract needle into the catheter ☐Observe that needle is completely retracted inside catheter ☐ Withdraw catheter from scope	Yes / No Score ____/10
10. TBNA: Decision making: (5 points each, target 10 points) ☐Image 4 ☐Image 5	Yes / No Score ____/10

* The combined use of the 10 items pertains to technical skills needed to climb learning curve from novice to advanced beginner to intermediate to competent bronchoscopist able to perform flexible bronchoscopy with transbronchial lung biopsy and transbronchial needle aspiration independently.

FINAL GRADE PASS FAIL **SCORE** _____/100

User Instructions

Bronchoscopy Skills and Tasks Assessment Tool, for Transbronchial Lung Biopsy and Transbronchial Needle Aspiration (BSTAT-TBLB/TBNA)

Educational Item* Items 1-10 each scored separately	**Satisfactory Yes/No**
1. TBLB: Airway inspection without trauma (no partial points) ☐ Complete inspection done properly *It goes without saying that the student should be able to perform inspection bronchoscopy and be able to identify and enter all bronchial segments.	Yes / No Score ____/5
2. TBLB technique (no partial points) ☐Wedge scope into target segment ☐ Visualize target with fluoroscopy ☐Advance forceps under fluoroscopy guidance to target ☐ Open forceps at target ☐ Advance and close forceps at target ☐ Remove forceps from scope *Many techniques exist for TBLB, but the instructor should focus on certain universal principles. The student should be able to wedge and unwedge the scope, and go through the various motions for TBLB including use of expiration and inspiration. Proper use of fluoroscopy requires a passing grade on the fluoroscopy test. Communication is key with instructions such as open and close forceps. If all six steps are completed satisfactorily, the student receives 10 points.	Yes / No Score ____/10
3. TBLB Complications: Pneumothorax (no partial points) ☐ Perform panoramic view of hemithorax using fluoroscopy ☐Recognize signs and symptoms ☐ Demonstrate easy access to small or large bore chest tube *The student should be able to demonstrate the ability to respond quickly to this adverse event. Team communication is key, and the instructor should ascertain that the student is able to give appropriate instructions to nursing staff.	Yes / No Score ____/10
4. TBLB: Complications: Bleeding (no partial points) ☐ Scope wedged into target segment ☐Movepatient into lateral decubitus safety position ☐ Access upper airway with oral suction ☐Demonstrate access and use of bite block and endotracheal tube *The student should be able to demonstrate the ability to respond quickly to this adverse event. Team communication is key, and the instructor should ascertain that the student is able to give appropriate instructions to nursing staff.	Yes / No Score ____/10
5. TBLB: Decision making (5 points each , target score 15 points) ☐ Image 1 ☐ Image 2 ☐Image 3 *The written test also serves as the answer sheet; to be used with associated slide-show. Tests should be collected. Students can be given their scores, but should not be provided with the correct answers so that they can take the test at a later date	Yes / No Score ____/15
6. TBNA: Airway inspection and imaging interpretation (5 points each) ☐ Complete inspection done properly ☐Imaging studies correctly interpreted Imaging studies should be reviewed prior to bronchoscopy. Instructor should be certain that the student can justify the procedure and has formulated a plan.	Yes / No Score ____/10

7. TBNA Technique - Jab (no partial points) ☐Advance catheter towards target area ☐ Advance needle to target area without airway trauma ☐ Jab needle through airway wall at target region while scope is fixed at nose or mouth ☐ Move needle back and forth inside node while suctioning ☐Release suction prior to needle withdrawal from target region ☐ Retract needle into the catheter ☐ Observe that needle is completely retracted inside catheter ☐ Withdraw catheter from scope *While there are many ways to perform TBNA these universal principles and instructions are well described by experts. The student should understand these principles and be able to perform each of the three techniques because each one may be necessary in a different setting. The student should be using appropriate safety measures in regards to needle in, needle out instructions, handling the needle catheter, and while withdrawing the catheter from the scope. No partial points are given for any of the techniques.	Yes / No Score ____/10
8. TBNA Technique-Hub against wall (no partial points) ☐Advance catheter towards target area ☐ Touch catheter to target area without airway trauma ☐ Penetrate airway wall with needle while holding scope firmly ☐Move needle back and forth inside node while suctioning ☐ Release suction prior to needle withdrawal from target region ☐ Retract needle into the catheter ☐Observe that needle is completely retracted inside catheter ☐ Withdraw catheter from scope	Yes / No Score ____/10
9. TBNA Technique -Piggyback: (no partial points) ☐Secure catheter and scope simultaneously with one hand ☐ Advance scope and catheter as a single unit to target region ☐ Penetrate airway wall at target region ☐Move needle back and forth inside node while suctioning ☐ Release suction prior to needle withdrawal from target region ☐ Retract needle into the catheter ☐Observe that needle is completely retracted inside catheter ☐ Withdraw catheter from scope	Yes / No Score ____/10
10. TBNA: Decision making: (5 points each, target 10 points) ☐ Image 4 ☐ Image 5 *The written test also serves as the answer sheet; to be used with associated slide-show. Tests should be collected. Students can be given their scores, but should not be provided with the correct answers so that they can take the test at a later date	Yes / No Score ____/10

* The combined use of these 10 items pertains to technical skills needed to climb learning curve from novice to advanced beginner to intermediate to competent bronchoscopist able to perform flexible bronchoscopy with transbronchial lung biopsy and transbronchial needle aspiration independently.

FINAL GRADE PASS FAIL **SCORE** _____/100

Bronchoscopy Self Assessment Tool (BSAT)

Please answer each question by writing the number that most closely represents your experience with the Bronchoscopy Education Program using the following scale.

1	2	3	4	5
Not comfortable		Comfortable		Very comfortable

1. I am able to identify airway anatomy ___
2. I am able to identify airway mucosal abnormalities ___
3. I am able to describe secretions and other airway abnormalities ___
4. I am able to maneuver the flexible bronchoscope ___
5. I am able to do a BAL through the flexible bronchoscope ___
6. I am able to use a brush through the flexible bronchoscope ___
7. I am able to use a forceps to perform an endobronchial biopsy ___
8. I am able to use a forceps to perform a transbronchial biopsy ___
9. I am able to perform a conventional transbronchial needle aspiration ___
10. I would now feel comfortable performing this case in a patient ___

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

_____
_____
_____
_____
_____

Section 10

Checklists

A collection of checklists,
with and without user instructions:

- Moderate sedation
- Fluoroscopy
- Informed consent
- Procedural pause
- Practical Approach
- Proctored bronchoscopy

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Scoring Recommendations for CHECKLISTS

(Informed Consent, Procedural Pause, Fluoroscopy, Moderate Sedation, Patient Safety, Proctored Bronchoscopy,)

The goal of these checklists is to be able to monitor a student'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 student's performance that each of the TEN elements in each tool are covered satisfactorily. The frequency with which these tools should be used remains to be studied and is currently at the discretion of program directors.

Repeated testing will demonstrate knowledge and skill acquisition as the student climbs the learning curve from novice to advanced beginner, intermediate and competent bronchoscopist for the procedure being assessed.

To maximize objective scoring, each task in the checklists has been defined explicitly in this user manual. Participation in specially-designed *Train-the-Trainers* courses being currently organized is encouraged to assist with standardization, and to help instructors use this program to its fullest potential.

Scores can be plotted on a graph, and each institution/program can obviously 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 student to be judged competent to perform bronchoscopy independently.

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.

Category	**Score**
Novice	< 60
Advanced Beginner	60-79
Intermediate	80-99
Competent	100

Specific instructions marked by an asterisk (*) are provided in each of the following checklists.

MODERATE SEDATION 10-Point CHECKLIST*

Student _____ Training Year _____

Faculty _____ Date _____

☐ Interactive session ☐ Patient environment

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory Yes/No**
2. Definitions ☐ Moderate sedation ☐ Deep sedation	Yes / No
2. Able to obtain moderate sedation informed consent	Yes / No
3. Able to describe ASA classification ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐5	Yes / No
3. Able to identify high risk patients	Yes / No
4. Able to describe potential contraindications	Yes / No
5. Able to list equipment that must be available	Yes / No
6. Sedation agents: role, dosage, precautions ☐ Midazolam ☐ Fentanyl	Yes / No
7. Reversal agents: role, dosage, precautions ☐ Flumazenil ☐ Naloxone	Yes / No
8. Able to describe how to respond to complications such as ☐ Vomiting ☐Seizure	Yes / No
9. Able to describe how to respond to over-sedation and ☐ Hypotension ☐ Airway obstruction	Yes / No
10. Able to describe how to respond to over-sedation and ☐ Hypoxemia ☐Respiratory failure	Yes / No

* Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

User Instructions

Moderate Sedation Checklist

Questions pertaining to sedation can be asked during a separate simulation session or during a patient encounter. The learner will have received the sedation synopsis as well as any institution-specific guidelines and protocols. A passing score of 100, although somewhat subjective, is encouraged.

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory** **Yes/No**
1. Definitions ☐ Moderate sedation ☐ Deep sedation	Yes / No
2. Able to obtain moderate sedation informed consent	Yes / No
2. Able to describe ASA classification ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐5	Yes / No
3. Able to identify high risk patients	Yes / No
4. Able to describe potential contraindications	Yes / No
5. Able to list equipment that must be available	Yes / No
6. Sedation agents: role, dosage, precautions ☐ Midazolam ☐ Fentanyl	Yes / No
7. Reversal agents: role, dosage, precautions ☐ Flumazenil ☐ Naloxone	Yes / No
8. Able to describe how to respond to complications such as ☐ Vomiting ☐Seizure	Yes / No
9. Able to describe how to respond to over-sedation and ☐ Hypotension ☐ Airway obstruction	Yes / No
10. Able to describe how to respond to over-sedation and ☐ Hypoxemia ☐Respiratory failure	Yes / No

* Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

FLUOROSCOPY 10-Point CHECKLIST*

Student _____ Training Year _____

Faculty _____ Date _____

☐ Interactive session ☐ Patient environment

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory Yes/No**
1. Able to list indications for using fluoroscopy	Yes / No
2. Able to describe the relevance of voltage and amperage ☐ For image quality ☐ For patient safety	Yes / No
3. Able to describe consequences of resolution, distortion, and lag ☐ For image quality ☐ For patient safety	Yes / No
4. Able to describe consequences of brightness and contrast ☐ For image quality ☐ For patient safety	Yes / No
5. Able to describe dangers of scattered radiation	Yes / No
6. Able to describe techniques to improve visibility of fluoroscopic image	Yes / No
7. Able to describe techniques used to reduce patient radiation exposure	Yes / No
8. Able to describe techniques used to reduce operator radiation exposure	Yes / No
9. Able to describe special precautions in case of suspected or known pregnancy ☐ Patients ☐ Health care providers	Yes / No
10. Able to describe basic operation procedures	Yes / No

* Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

User Instructions

Fluoroscopy Checklist

Questions pertaining to fluoroscopy can be asked during a separate simulation session or during a patient encounter. The learner will have received the fluoroscopy synopsis as well as any institution-specific guidelines and protocols. A passing score of 100, although somewhat subjective, is encouraged.

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory Yes/No**
1. Able to list indications for using fluoroscopy	Yes / No
2. Able to describe the relevance of voltage and amperage ☐ For image quality ☐ For patient safety	Yes / No
3. Able to describe consequences of resolution, distortion, and lag ☐ For image quality ☐ For patient safety	Yes / No
4. Able to describe consequences of brightness and contrast ☐ For image quality ☐ For patient safety	Yes / No
5. Able to describe dangers of scattered radiation	Yes / No
6. Able to describe techniques to improve visibility of fluoroscopic image	Yes / No
7. Able to describe techniques used to reduce patient radiation exposure	Yes / No
8. Able to describe techniques used to reduce operator radiation exposure	Yes / No
9. Able to describe special precautions in case of suspected or known pregnancy ☐ Patients ☐ Health care providers	Yes / No
10. Able to describe basic operation procedures	Yes / No

* Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

INFORMED CONSENT 10-Point CHECKLIST*

Student _____ Training Year _____

Faculty _____ Date _____

☐ Simulation Bronchoscopy Workshop ☐ Patient-based Bronchoscopy Scenario

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory Yes/No**
1. Able to define "Informed Consent": ☐ Informed decision-making regarding indications and expected outcomes, conflict of interest ☐ Protection from liability ☐ Provides opportunity to assess management strategies ☐ Provides opportunity to discuss risks, benefits, and alternatives	Yes / No
3. Able to discuss diagnosis and pertinent clinical issues	Yes / No
4. Able to describe the purpose of the procedure	Yes / No
5. Able to describe the nature of the procedure	Yes / No
6. Able to describe procedure-related risks	Yes / No
7. Able to describe procedure-related benefits	Yes / No
7. Able to describe alternative procedures regardless of cost or health care coverage	Yes / No
8. Able to describe potential risks and benefits from choosing the alternatives	Yes / No
9. Able to describe the risks and benefits of not performing the procedure or not choosing any of the alternatives	Yes / No
10. Able to demonstrate "effectiveness" of the informed consent process by asking the patient to explain in his or her own words, their understanding of the procedure	Yes / No

* Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

User Instructions

Informed consent Checklist

Educational Item* Items 1-10 are scored 10 points each (no partial points given)
8. Able to define "Informed Consent" ☐ Informed decision-making regarding indications and expected outcomes, conflict of interest ☐ Protection from liability ☐ Provides opportunity to assess management strategies ☐ Provides opportunity to discuss risks, benefits, and alternatives * The instructor may wish that the student be able to address some of the history of informed consent, and explain how and why informed consent plays a prominent role in medicine today.
2. Able to discuss diagnosis and pertinent clinical issues * Which diagnostic elements and clinical information help guide a patient's choice of procedures? Why is this particular procedure being performed based on diagnosis and clinical issues? This provides the background to the informed consent process and opens the door for a dialogue with the patient so that the patient understands that simple authorization to perform the procedures is not what is being requested.
3. Able to describe the purpose of the procedure * Based on the clinical picture, the procedure is placed into context and the different elements of the procedure (such as to obtain lung tissue, or to obtain lung secretions to look at under the microscope in order to detect infection) are described.
4. Able to describe the nature of the procedure * The procedure is described in layman's terms.
5. Able to describe procedure-related risks *Risks applicable to the procedure are noted; the student may offer a few questions and answers, such as when can the patient eat, will the procedure hurt, is there a chance for bleeding or lung collapse. Some patients may fear death, and so this also may need to be addressed. A description of risks can increase both state and trait anxiety, and therefore, patients should probably be asked about their anxiety level and whether medication or other interventions (music, hand-holding, family members present at bedside, etc) are desired.
6. Able to describe procedure-related benefits *Benefits should be described clearly, such as early diagnosis leads to early treatment, may avoid need for more invasive tests, ability to remove patients from isolation, provide information to other doctors to assist with therapeutic and diagnostic strategies, certain illnesses might be excluded so as to simplify further work-up.
7. Able to describe alternative procedures regardless of cost or health care coverage * Alternatives to bronchoscopy should be cited and described; these might

include, for example, invasive procedures such as open surgery, mediastinoscopy, percutaneous needle aspiration, and noninvasive procedures such as radiographic studies, etc.
8. Able to describe potential risks and benefits from choosing the alternatives * The risks and benefits from each of the alternatives should be addressed and explained. They can be compared to those of bronchoscopy, and the physician can provide expert opinion as to why bronchoscopy is being proposed and recommended.
9. Able to describe the risks and benefits of not performing the procedure or not choosing any of the alternatives * If bronchoscopy is not performed, the patient should be told about potential consequences, whether or not alternatives are chosen, such as, for example, delayed diagnosis, prolonged illness, endangerment, need for different modes of surveillance or subsequent diagnostic tests or therapeutic measures.
10.Able to demonstrate "effectiveness" of the informed consent process by asking the patient to explain in his or her own words, their understanding of the procedure * The patient should be asked to describe the bronchoscopy and its consequences in general terms. This also provides an opportunity for dialogue.

* Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

PROCEDURAL PAUSE 10-Point CHECKLIST*

Student _____ Training Year _____

Faculty _____ Date _____

☐ Simulation Bronchoscopy Workshop ☐ Patient-based Bronchoscopy Scenario

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory Yes/No**
1. Able to define "Procedural Pause" as: ☐ Time-Out ☐ Wrong patient, site, procedure ☐ Team communication/patient understanding ☐ Mandatory in USA	Yes / No
4. Able to describe requirements of the procedural pause: ☐ Immediately before procedure ☐ Correct site, position, procedure ☐ Correct patient ☐ Pertinent medical records and equipment ☐ Verbal acknowledgements by all team members ☐ Elimination of environmental distractions	Yes / No
5. Able to describe the team leader's role	Yes / No
6. Able to describe the nursing team's role	Yes / No
7. Able to describe the patient's role	Yes / No
8. Able to describe other person's roles (technicians, other physicians)	Yes / No
7. Able to list the elements that must be covered: ☐ Patient ☐ Procedure ☐ Side and site ☐ Informed consent ☐ Medical records and equipment ☐ Medications ☐ Allergies/drug reactions ☐ Safety concerns based on history	Yes / No
8. Able to address behaviors in case of distractions	Yes / No
9. Able to describe behaviors in case of disagreements	Yes / No
10. Able to describe other elements pertaining to assuring a culture of safety: ☐ Communication ☐ Ability to prevent and respond to complications ☐ Universal, Droplet, and Airborne pathogen precautions	Yes / No

Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

User Instructions

Procedural Pause Checklist

1. Able to define "Procedural Pause" as ☐ Time Out ☐ Wrong patient, site, procedure ☐Team communication/patient understanding ☐ Mandatory in USA
9. Able to describe requirements of the procedural pause ☐ Immediately before procedure ☐ Correct site, position, procedure ☐ Correct patient ☐ Pertinent medical records and equipment ☐ Verbal acknowledgements by all team members ☐ Elimination of environmental distractions
3. Able to describe the team leader's role * Mark the site if applicable, state name, patient, and procedure being performed, lead the time out, assure that all distractions are avoided during the time, requests a new time-out in case distractions occur, assures that time-out is being done according to protocol, addresses discrepancies, cancels procedure if all elements are not ascertained, modifies procedural strategy if applicable according to results of the time out.
4. Able to describe the nursing team's role * Assures patient identification using at least two independent identifiers, assures right side right patient, right procedure, reviews and reads informed consent, assures appropriate medical records and equipment are available, assures appropriate response to complications or adverse events is possible.
5. Able to describe the patient's role *If alert, able to state name, agree with procedure and site, signal family members who might be present.
6. Able to describe other person's roles (technicians other physicians) * Able to state name and role.
7. Able to list the elements that must be covered ☐ Patient ☐Procedure ☐Side and site ☐Informed consent ☐Medical records and equipment ☐ Medications ☐Allergies/drug reactions ☐Safety concerns based on history
8. Able to address behaviors in case of distractions *No one should enter or leave the room during the time-out; any interruptions should prompt renewing the time-out; if a new or second procedure is being performed, time-out should be repeated; individuals should remain silent so that all present can focus on the time-out being performed.
9. Able to describe behaviors in case of disagreements * Verbal comments, behavior modification during or after the time-out; anyone should be able to disagree with what is being said during the time-out if it is inconsistent with the informed consent, predesignated procedural strategy, or clinical suspicions.
10. Able to describe other elements pertaining to assuring a culture of safety ☐ Communication ☐Ability to prevent and respond to complications ☐Universal, Droplet, and Airborne pathogen precautions *It is understood that differences between institutions and countries exist. Guidelines specific to each institution or country of practice can be given to students. General rules and concepts, however, should be understood and are covered in the special simulation session.

PRACTICAL APPROACH 10 Point CHECKLIST*

Student _____ Training Year _____

Faculty _____ Date _____

☐ Instructor-learner 30 minute session ☐ Daily rounds & bronchoscopy consultation

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory Yes/No**
1. Initial evaluation A ☐ Physical examination, laboratory tests, and functional assessment ☐ Comorbidities	Yes / No
2. Initial evaluation B ☐ Support system ☐ Preferences and expectations	Yes / No
3. Procedural strategies A ☐ Indications, contraindications, expected results ☐ Operator and team experience and expertise	Yes / No
4. Procedural strategies B ☐ Risk-benefits and therapeutic alternatives ☐ Informed consent	Yes / No
5. Techniques and results A ☐ Anesthesia and perioperative care ☐ Techniques and instruments	Yes / No
6. Techniques and results B ☐ Anatomic dangers and other risks ☐ Results and complications	Yes / No
7. Long-term management plan A ☐ Outcome assessment ☐ Follow-up tests and procedures	Yes / No
8. Long-term management plan B ☐ Referrals to other specialists ☐ Quality improvement and team evaluation	Yes / No
9. Able to answer case-specific questions ☐ Question 1 ☐ Question 2 ☐ Question 3	Yes / No
10. General ability to provide evidence for and rationally justify decision making ☐ Subjective assessment of learner ability	Yes / No

*These 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

User Instructions

Practical Approach Checklist

This practical approach exercise is held as a 30-minute session between learner and instructor, similar to an "oral examination". Of course, programs including Practical Approach-like discussions for each bronchoscopy consultation may choose to forego a formal session. Using a structured format (the four boxes), learners and instructors are more certain to cover in as great a depth as desired all aspects of a procedure: strategy and planning, techniques and instruments, and response to complications. Because each element is important, items are equally weighted at ten points each with no partial points given. A passing score of 100, although somewhat subjective, is encouraged.

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory Yes/No**
2. Initial evaluation A ☐ Physical examination, laboratory tests, and functional assessment ☐ Comorbidities	Yes / No
2. Initial evaluation B ☐ Support system ☐ Preferences and expectations	Yes / No
3. Procedural strategies A ☐ Indications, contraindications, expected results ☐ Operator and team experience and expertise	Yes / No
4. Procedural strategies B ☐ Risk-benefits and therapeutic alternatives ☐ Informed consent	Yes / No
5. Techniques and results A ☐ Anesthesia and perioperative care ☐ Techniques and instruments	Yes / No
6. Techniques and results B ☐ Anatomic dangers and other risks ☐ Results and complications	Yes / No
7. Long-term management plan A ☐ Outcome assessment ☐ Follow-up tests and procedures	Yes / No
8. Long-term management plan B ☐ Referrals to other specialists ☐ Quality improvement and team evaluation	Yes / No
9. Able to answer case-specific questions ☐ Question 1 ☐ Question 2 ☐ Question 3	Yes / No
10. General ability to provide evidence for and rationally justify decision making ☐ Subjective assessment of learner ability	Yes / No

*These 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

PROCTORED FLEXIBLE BRONCHOSCOPY 10-Point CHECKLIST*

Student _____ Training Year _____

Faculty _____ Date _____

☐ Simulation Bronchoscopy Workshop ☐ Patient-based Bronchoscopy Scenario

Educational Item* Items 1-10 are scored 10 points each (no partial points given)	**Satisfactory Yes/No**
1. Formulation of effective plan and strategy: ☐ Informed consent obtained, signed and in medical record ☐ History and physical ☐ Review imaging studies ☐ Cost-effective practice ☐ Use of information resources ☐ Applies evidence-based medicine ☐ Use of systems resources	Yes / No
2. Patient safety: ☐ ASA assessment ☐ Airway assessment ☐ Allergies ☐ Medications ☐ Comorbidities	Yes / No
3. Patient safety: ☐ Positioning ☐ Supplemental oxygen ☐ Vital signs ☐ Suction ☐ Bite-block and/or ET tube if applicable ☐ Verifies ability to respond to complications and accessibility of resuscitation equipment	Yes / No
4. Patient and procedural team safety: ☐ Protection from radiation/lead shielding; badge use ☐ Eye protection ☐ Knowledgeable use of fluoroscopy ☐ Hand disinfection ☐ Universal precautions ☐ "Time-Out".	Yes / No
5. Procedure: ☐ Premedication ☐ Moderate sedation ☐ Topical anesthetic	Yes / No
6. Procedure: ☐ Scope insertion ☐ Topical anesthetic ☐ Passage through vocal cords ☐ Empathy and communication with patient	Yes / No
7. Procedure: ☐ Inspection of tracheobronchial tree ☐ Identification of abnormalities ☐ Atraumatic removal of bronchoscope	Yes / No
8. Procedure: ☐ BAL ☐ Mucosal biopsy ☐ Lung biopsy ☐ Brush ☐ TBNA ☐ EBUS	Yes / No
9. Communication with staff, patient, and patient family ☐ Puts needs of patient first ☐ Punctuality ☐ Respect ☐ Listening skills ☐ Personal appearance ☐ Initiative & Motivation ☐ Empathy ☐ Honesty ☐ Accepts responsibility	Yes / No
10. Documentation/procedure note ☐ Informative ☐ Accurate ☐ Communication with colleagues	Yes / No

* Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

User Instructions

Proctored Flexible Bronchoscopy Checklist

Educational Item* Items 1-10 each scored 10 points (no partial points given)
1. Formulation of effective plan and strategy ☐ Informed consent obtained, signed and in medical record ☐ History and physical ☐Review imaging studies ☐Cost-effective practice ☐ Use of information resources ☐ Applies evidence-based medicine ☐ Use of systems resources * The instructor should be certain that the student has obtained the informed consent and that it is signed and in the chart. The student should be able to describe pertinent clinical and radiographic findings and to use evidence-based medicine in addition to any other information gained from other resources, such as faculty expert opinion, advice, and requests by referring physicians, to justify the procedure being performed. The student should be able to describe the use of institutional resources, and use them according to institutional practices, such as fluoroscopy, ultrasound, computed tomography, electrocautery and other instruments and equipment. This also includes nursing surveillance, respiratory therapy assistance, need for procedure suite, operating theater or intensive care unit. Cost-effectiveness can be discussed in regards to other diagnostic or therapeutic modalities, but also how bronchoscopy may or may not increase or decrease health-related expenditures in the context of the patient's diagnosis and treatment plan.
2. Patient safety: ☐ ASA assessment ☐Airway assessment ☐Allergies ☐Medications ☐ Comorbidities *ASA and Airway assessments should be performed according to the institution's guidelines. Allergies, medications, especially anticoagulants and antiplatelet agents should be noted, comorbidities that might increase the risk of adverse events should also be described and identified.
3. Patient safety: ☐ Positioning ☐Supplemental oxygen ☐Vital signs ☐Suction ☐Bite-block and/or ET tube if applicable ☐ Verifies ability to respond to complications and accessibility of resuscitation equipment *These measures should be taken according to institutional biases and protocols.
4. Patient and procedural team safety: ☐ Protection from radiation/lead shielding, badge use ☐ Eye protection ☐ Knowledgeable use of fluoroscopy ☐Hand disinfection ☐Universal precautions ☐ "Time-Out". *Students should be observed as they comply with these safety measures. Additional information pertaining to time-out, universal precautions, and knowledge of fluoroscopy are provided in the modules. Protocols may vary among institutions.
5. Procedure: ☐ Premedication ☐Moderate sedation ☐Topical anesthetic

*These should be administered according to institutional biases and according to protocols.
6. Procedure: ☐ Scope insertion ☐Topical anesthetic ☐Passage through vocal cords ☐ Empathy and communication with patient *Done according to institutional practices. Empathy and communication with the patient should be observed. Students should be able to speak comfortably and reassuringly with their patient. Open dialogues should be encouraged to enhance confidence and decrease patient anxiety.
7. Procedure: ☐ Inspection of tracheobronchial tree☐ Identification of abnormalities ☐ Atraumatic removal of bronchoscope *Performed according to institutional practices.
8. Procedure: ☐ BAL ☐ Mucosal biopsy ☐Lung biopsy ☐ Brush ☐TBNA ☐ EBUS *Performed according to institutional practices. It is recognized that not all patients will undergo all of these procedures, therefore, if the institution desires, a different proctored checklist can be completed for each (or each set) of the procedures listed.
9. Communication with staff, patient, and patient family ☐ Puts needs of patient first ☐ Punctuality ☐ Respect ☐Listening skills ☐ Personal appearance ☐Initiative & Motivation ☐Empathy ☐Honesty ☐ Accepts responsbility *These are for the most part subjective assessments, and also require feedback from nursing staff. Students should be told that they will be judged on these items during the course of their training, so that they can obtain feedback from their instructors and improve their performance in these areas.
10.**Documentation/procedure note** ☐ Informative ☐Accurate ☐Communication with colleagues *Procedure notes may vary according to institution; however, in general, the note should be informative, telling a story about the procedure that referring physicians can understand. The note should be accurate regarding what was done, why it was done, and how it was done. Procedure-related adverse events should be described. Communication with colleagues should be observed, by watching how the student interacts with the nursing team, other physicians, and with referring physicians. While this element is also, for the most part subjective, in general, communication should be informative, accurate polite, and considerate.

* Each of the 10 items contains all of the elements required by ACGME (patient care, medical knowledge, practice-based learning and improvement, interpersonal communication skills, professionalism, and systems-based practice).

FINAL GRADE PASS FAIL **SCORE** _____/100

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Section 11

Train the Trainers

An Excerpt of the Train the Trainers Manual

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The following section is an introduction to the **Train the Trainers Program.** This seminar is devoted to helping you acquire the necessary skills to teach the *Introduction to Flexible Bronchoscopy* curriculum. It is divided into two sections:

- Familiarization with the curriculum, the lectures and their administration, the models used, and the assessment tools and how they can be administered and scored. We refer to this basic section as the Trainer Initiation Program.

- A more in-depth discussion of the conceptual topics involved in bronchoscopy education. These topics include curriculum development, adaptation and incorporation, adult learning theory, coaching and feedback skills, individualized and group instruction, incorporation of new learning and assessment materials and methodologies, confidence building, audience engagement and enthusiasm generation, handling difficult learners, motivational education, and much more.

We sincerely hope that all of our efforts in planning and preparing this course will result in substantial learning and enjoyment on your part. We also hope that you will learn techniques that will assist you in your teaching, and that you will feel comfortable incorporating elements from this curriculum in your future teaching endeavors.

Because we value your assessment of our program, we would appreciate very much having you give your attention to the evaluation forms distributed throughout this seminar. It will also be very important to complete the various self assessment and 360 degree evaluations, and to do your best to use the teaching portfolio during the course of the next year. Our instructors remain available to assist you with your teaching endeavors as you enter teaching experiences into your portfolio.

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"TRAIN THE TRAINERS"

A seminar in preparation for the one-day structured course:

INTRODUCTION TO FLEXIBLE BRONCHOSCOPY

BRONCHOSCOPY INTERNATIONAL©

FOUNDATION FOR THE ADVANCEMENT OF MEDICINE
A NON-PROFIT 501 (C) 3 ORGANIZATION
(Tax ID 33-0593357, registration, San Diego, CA, USA)

"Teaching can be fun, so learners have fun learning"
Henri Colt MD
Founder, Bronchoscopy International

PURPOSE: To assure the appropriate transmission of a structured curriculum pertaining to an introductory course in flexible bronchoscopy in order to help establish a minimum standard of bronchoscopic knowledge and technical skill. This structured curriculum is specifically designed to provide learners with cognitive, technical, affective, and experiential skills which are complementary to mandatory apprenticeship-based learning in tertiary training institutions and to post-graduate courses sponsored by national and international Bronchology and/or Pulmonary associations. By participating in this seminar, participants will improve their teaching skills and be better able to incorporate all or part of the *Introduction to flexible bronchoscopy curriculum* into their own courses and workshops.

Cost: This seminar is provided free of charge as part of the educational activities of Bronchoscopy International©. This forum of experts and educators is founded on the premise that (1) knowledge should be democratized and readily accessible, and (2) patients should not bear the burden of procedure-related training.

OBJECTIVES: By the end of this seminar, the participant will be able to

1. Identify how instructors and program directors can use elements from the Bronchoscopy Education Project to document migration along the bronchoscopy learning curve from novice to advanced beginner to intermediate to competent.
2. Demonstrate how to teach the Bronchoscopy step-by-step© exercises in a lo-fidelity model using a hands-off approach to instruction.
3. Demonstrate how to teach bronchoscopic brushing and biopsy in a lo-fidelity model using a hands-off approach to instruction.
4. Demonstrate how to teach transbronchial needle aspiration in a lo-fidelity model using a hands-off approach to instruction.
5. Demonstrate how to use validated Bronchoscopy Assessment Tools© in order to objectively measure a student's technical skill.
6. Demonstrate how to use various checklists to ascertain knowledge and skill acquisition in areas relating to bronchoscopy, including informed consent, sedation, fluoroscopy, and overall competency in flexible bronchoscopy.
7. Demonstrate how to effectively create and use *Practical Approach to Bronchoscopic Decision Making™* exercises as part of a learning curriculum.
8. Demonstrate how multiple choice questions from the Essential Bronchoscopist© can be used as part of an interactive session with learners.
9. Demonstrate the ability to incorporate interactive techniques into a didactic lecture pertaining to a structured curriculum of bronchoscopic knowledge.
10. Demonstrate the acquisition of knowledge pertaining to educational philosophies and techniques while performing open-book, problem-based learning exercises.
11. Demonstrate the ability to work as a team in order to deliver a structured curriculum of bronchoscopic knowledge.
12. Demonstrate the ability to work individually and as a team in order to provide constructive feedback to oneself and others regarding learning skills, teaching skills, assessments, and organizational structure.

DESCRIPTION OF ACTIVITIES:

1. Before the course, participants will receive the *Introduction to flexible bronchoscopy* curriculum on CD, as well as reading material pertaining to the philosophies and techniques of education, and selected literature pertaining to flexible bronchoscopy. These materials will be used during the seminar to acquire and improve various teaching skills.
2. Before the course, participants will become familiar with the Essential Bronchoscopist© and other components of the ever-expanding on-line curriculum. They will select two questions from the EB© that they will use to practice interactive teaching during a role playing exercise to the other participants.
3. Each participant will contribute to the writing of a *Practical Approach* scenario, ether during or prior to the seminar. This will be done as a Word document. Participants will also write a Practical Approach PowerPoint presentation using the *Practical Approach* template (templates and case examples will be provided to the participants well in advance). Working in teams, each will select a representative to present the scenario and completed exercise to the group. The group will provide constructive criticism in order to help improve the content and delivery of the PowerPoint presentation.
4. To view, review, and practice Bronchoscopy step by step© exercises. At the time of the course, each participant will perform these exercises under guidance (as if they were actually teaching them) in order to improve their teaching skills.
5. To view, review, and practice bronchoscopic brushing, biopsy, and TBNA in a lo-fidelity model. At the time of the seminar, each participant will perform these procedures under guidance (as if they were actually teaching them) in order to improve their teaching skills.
6. To repeatedly test a surrogate student in order to practice and standardize scoring techniques using the Bronchoscopy Assessment Tools©. Scenarios will include testing of Step-by-Step exercises, specific tasks (such as going directly to the right middle lobe bronchus), and performing inspection flexible bronchoscopy, TBNA, and Brushings/biopsy in a lo-fidelity model.
7. To repeatedly test a surrogate student (role-playing exercises) using checklists.

8. During the seminar, participants will practice working as a team in order to complete and present problem-based learning exercises, didactic lectures, interactive sessions, and 360 degree feedback.

EVALUATION: Good assessments are part of good learning and good teaching.

1. Participants will be asked to perform a self-assessment and a 360 degree assessment of their colleagues' skills and behaviors after completion of the didactic and interactive lectures.
2. Participants will be asked to perform a self-assessment and a 360 degree assessment of their colleagues' skills and behaviors after completion of the hands-on training sessions.
3. Participants will be asked to perform a self-assessment and a 360 degree assessment of their colleagues' skills and behaviors after completion of the group problem-based learning exercises.
4. At the end of the day, participants will be asked to complete a global assessment of the entire seminar, including their pre-seminar work, and to identify specific strengths and weaknesses of the seminar's curriculum and training activities.
5. During the course of one year after the seminar, participants will be asked to keep a personal portfolio of their bronchoscopy teaching activities, and to self-qualify their performance and areas of improvement.
6. During the course of the next two years after the seminar, participants will be asked to organize or participate in regional introductory courses in order to encourage standardization of the bronchoscopy educational process.

CERTIFICATION: After completion of this *Train the Trainers* seminar, each participant will receive a certificate of completion identifying them as a certified trainer for the "Introduction to flexible bronchoscopy Course" for Bronchoscopy International©.

CURRICULUM FOR TRAINERS in *Introduction to flexible bronchoscopy*

Members of the core faculty of this curriculum are expert bronchoscopists and medical educators who have considerable experience teaching structured curricula, and

who are also experienced in teaching and evaluating technical bronchoscopy skills, working one-on-one with learners, writing practical approach scenarios and presentations, creating and moderating problem-based learning sessions, as well as in facilitating or presenting interactive, simulation-based, and didactic classroom lectures. These faculty members are familiar with adult education techniques, and keep up to date with the educational process. They remain current and well read in regards to the bronchoscopy literature, and have experience working within a diverse medical cultural environment. They have been active researchers and have participated in the writing and publication of numerous peer reviewed articles, and have gained experience with the creation, validation, and use of simulation technologies.

The global purpose of this curriculum is to help create a core of expert bronchoscopists familiar with educational philosophies and techniques, and capable of designing and delivering a structured curriculum of "basic" flexible bronchoscopy. It is our hope that this core group of *trainers* will be able to effectively teach their students and colleagues in order to enhance cognitive knowledge, improve technical skill, and provide a forum that nurtures professionalism and competency in the context of shared decision making and ethical medical procedural practice.

The Curriculum

Prior to attending the seminar, participants will have received a packet of materials that includes (1) the full *Introduction to flexible bronchoscopy* curriculum, (2) the Bronchoscopy Stet-by-Step video exercises with commentary, (3) a set of PowerPoint Presentations with audio commentaries describing some examples of how to teach various bronchoscopic skills, and how to create a Practical Approach exercise, (4) a selection of articles pertaining to the validation and application of structured bronchoscopy curricula and simulation, (5) a selection of articles pertaining to basic education philosophies and techniques, (6) a selection of articles pertaining to basic flexible bronchoscopy techniques such as biopsy, brushings, bronchoalveolar lavage, foreign body removal, emergency intubation, endobronchial biopsy, transbronchial lung biopsy, conventional transbronchial needle aspiration, airway anatomy, history of flexible bronchoscopy, sedation, diagnostic strategies in specific diseases such as infectious lung diseases, lung cancer, and fixed and dynamic central airway obstruction, patient safety,

medical ethics relating to minimally invasive procedures and use of novel technologies, and review papers pertaining to competency, professionalism, informed consent, (7) a set of bronchoscopy assessment tools and checklists, (8) a Bronchoscopy Education Project Manual and related teaching modules.

The curriculum begins with an orientation comprised of an introductory session during which participants are oriented to the philosophy and scope of practice of Bronchoscopy International, a forum of experts devoted to the dissemination and open acquisition of bronchoscopic knowledge. During this lecture, participants will learn more about the ever-growing, web-based, six part curriculum that includes: The Essential Bronchoscopist, BronchAtlas, Bronchoscopy Step-by-Step, Bronchoscopy Assessment Tools, The Art of Bronchoscopy, and Practical Approach to Bronchoscopy Decision Making. They will learn how these instruments can be used for individual and group learning, and they will become more familiar with how they might also contribute to this on-line resource. This session will introduce participants to some of the basic principles used in adult education, and present some examples of techniques, analogies, and methods, with which procedural narratives might be used to send home a message, share a technical skill, memorize and exercise, or rationally think through a procedural consultation. Participants will become familiar with general vocabulary used in adult education, review pertinent articles pertaining to the use of simulation technology for training purposes, understand the complexities of competency-based training and the importance of ongoing assessments and continued learning. Participants will also become familiar with the Bronchoscopy Education Project, our attempt to provide program directors and educators worldwide with a standardized turnkey curriculum for flexible bronchoscopy training, which ultimately, can be altered as needed based on regional and institutional needs. Finally, this introductory session will convey the major goal of the proposed curriculum, which is to provide a learning environment in which participants can learn to work together as a team and to have fun while teaching, so that their future students might also have fun learning in their quest for degrees of competency that will benefit their patients, their colleagues, and society as a whole.

Subsequent components of the curriculum are structured to elicit interest, teamwork, and individual analysis of one’s knowledge and technical skill. Using a

multimodality learning program, participants will experience the learning process, and thus be able to better communicate with future learners of basic flexible bronchoscopy skills. They will experience multimedia presentations, and learn how on-site visual, auditory, and video technologies can be used in addition to various other educational systems in order to enhance a skill, promote knowledge, acquire experience, think through a problem-based scenario, and rationalize the decision-making process. During the course of one and a half days, activities will be divided into classroom didactic sessions, round table group discussions, team presentations, and hands-on technical skills training and testing using simulation-based scenarios.

Because it is important to evaluate the process of teaching in order to improve one's own abilities, and also to be able to assess without judging a learner's ability in order to provide positive reinforcement, participants will be asked to self-qualify their own learning and teaching experiences, and to provide 360 degree feedback for the other participants in their group. Questions extracted from commonly used leadership development and educator development courses will be used to create specific 360 degree instruments. Although scores will be collected by the seminar organizers for use in an ongoing research evaluation of the *Train the Trainers* Course curriculum, these will be reviewed and tabulated anonymously. Results will be provided to the course participants for their personal review, and faculty will be available to discuss results with individuals on a confidential level if desired. Because each seminar participant is considered an experienced bronchoscopist in his and her own right, participants should each consider themselves as "first among equals". One of the major strengths, therefore, of this seminar, is learning through shared experience within a context of facilitation.

Group exercises will help participants function as a team. This is an essential element of the teaching process, because during the delivery of a structured bronchoscopy curriculum, instructors must be able to "feed off each other", providing information to learners based on experience, contradictory evidence, and opinion. Not all practitioners think or behave alike, yet, in an effort to create a common foundation of bronchoscopic knowledge and skill, they must agree on certain basic principles. Many of these will be reviewed and commented upon during the seminar. In addition, participants will learn to work together in order to justify procedural decisions, approach an adult

learning educational problem, appreciate the advantages and obstacles of problem-based learning, design an introductory course curriculum, create and deliver an interactive session, and give a didactic lecture in a fixed period of time. Using a faculty panel model, participants will simulate the teaching environment of the *Introduction to flexible bronchoscopy curriculum*, and experience some of the difficulties that might be encountered when teaching this curriculum to a large group of novice as well as experienced bronchoscopists.

In order to help participants master some of the technical skills necessary in performing bronchoscopy step-by-step exercises, and also to share a philosophy of teaching that emphasizes guided practice rather than demonstration, several hours of the curriculum are devoted to hands-on flexible bronchoscopy training. During these sessions, participants will learn, demonstrate, and teach bronchoscopy step-by-step exercises, in addition to brushing, mucosal biopsy, and TBNA of level 4 and level 7 lymph nodes using validated lo-fidelity airway models. In addition, participants will become familiar with the validated set of Bronchoscopy Assessment tools, so that they can incorporate these into their own courses, or modify them accordingly to their individual needs. Using a hands-off approach, small groups of participants will simultaneously observe and score a course instructor learning step by step exercises, specific tasks such as going straight to the right middle love bronchus, and using 10 point checklists to ascertain knowledge and skill acquisition. These tasks will be repeated as often as necessary until participants feel comfortable with the scoring process, and until a relatively high rate of inter-observer reliability is obtained. Participants will also practice specific coaching techniques such as use of positive reinforcement, correction by demonstration, correction by explanation, use of analogy, and patient-based narratives (why a specific technique will prove to be helpful when performing bronchoscopy in a real patient).

360 degree assessments, in addition to self-qualifying assessments will be completed during the course of the program. Participants will be asked to self qualify their experience and behaviors in regard to group activities, individual didactic teaching exercises, and individual hands-on teaching. They will also be asked to evaluate other participants during group activities, individual didactic teaching exercises, and during hands-on training if possible. These 360 degree assessments will be kept confidential, but

are necessary to help participants learn about how they are perceived, and to potentially help learners modify certain behaviors, habits, of manners of speech or hands-on training techniques. In addition, such activities help participants evaluate the process of teaching, creating an environment of trust and teamwork, while providing program organizers with feedback needed to improve the curriculum for future train-the-trainers seminars.

Overall, the seminar requires 4 hours of simulation-based hands-on training and 10 hours of didactics/interactive sessions onsite, in addition to more than 10 hours of individual reading and preparation. Course work will be completed during a 1 ½ day program delivered on site at the training center, and will include snacks, lunch, and a working dinner. A certificate of completion will be delivered, in addition to an empty portfolio in which participants will be able to record and self-qualify their teaching experiences throughout the next year.

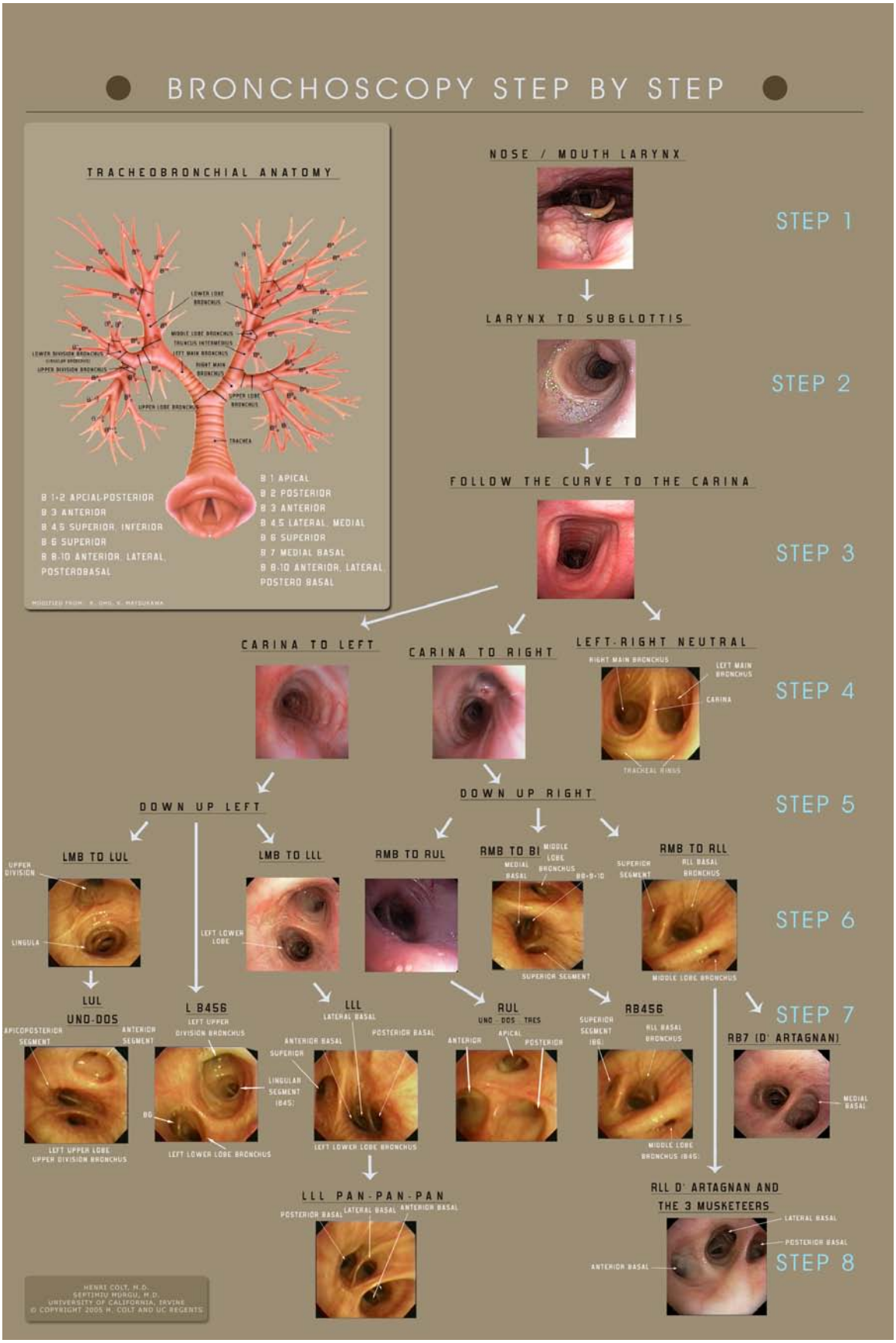
Table 1: Train the Trainers Curriculum for Introduction to Flexible Bronchoscopy: Individual, Didactic/Interactive Sessions and Roundtable Discussions

Program	Topics	Duration
Orientation	Introduction to the curriculum, learning philosophies, and methods	1 hour
Interactive session using the Essential Bronchoscopist	Each participant uses one or two questions from the EB to address the audience and teach about a topic	1 hour
Problem-based learning group exercise followed by debriefing	Educational philosophies using 10-point checklists and assessment tools and incorporating them into a training program	1.5 hours
Didactic lecture	In groups of two or three, participants deliver one of the *Introduction to flexible bronchoscopy* curriculum presentations	1 hour
Interactive session using audience participation system or true/false exercises	In groups of two or three, participants generate controversy and consensus regarding specific bronchoscopic strategies and results	1 hour
Practical Approach Exercise	In groups of four, an individual PA scenario and exercise is created using the PA PowerPoint template and the four-box approach to procedural decision making	30 minutes-one hour
Practical Approach didactic lecture	An individual from each group delivers the presentation in 10-15 minutes	30 minutes-one hour
Problem-based learning group exercise and debriefing	Educational techniques and structure: designing a one- or two-day curriculum (goals, content, obstacles, results)	1.5 hours
Improving performance (didactic lecture)	How to become an effective trainer	30 minutes
360-degree feedback and self-qualified assessments	Based on behavior and performance during group exercises, and individual teaching assignment	30 minutes

Table 2: Train the Trainers Curriculum for Introduction to Flexible Bronchoscopy: Simulation-based, hands-on sessions

Program	Topic	Duration
Learning and teaching Step-by-Step	Bronchoscopy exercises**	1 hour
Standardized scoring using *Bronchoscopy Assessment Tools*	BSAT, BSTAT, BSTAT-TBLB/TBNA	1 hour
Simulation-based bronchoscopy training	Teaching TBNA using hands-off technique (instruments, patient safety, protecting the equipment, use of the assistant)	1 hour
Simulation-based module training	Informed consent, patient safety, procedural pause, sedation, fluoroscopy	1 hour

** *Bronchoscopy Step-by-Step Poster on Page 116*


BRONCHOSCOPY STEP BY STEP
TRACHEOBRONCHIAL ANATOMY
B 1-2 APICAL-POSTERIOR
B 3 ANTERIOR
B 4 5 SUPERIOR, INFERIOR
B 6 SUPERIOR
B 8-10 ANTERIOR, LATERAL, POSTEROBASAL
B 1 APICAL
B 2 POSTERIOR
B 3 ANTERIOR
B 4 5 LATERAL, MEDIAL
B 6 SUPERIOR
B 7 MEDIAL BASAL
B 8-10 ANTERIOR, LATERAL POSTERO BASAL
NOSE / MOUTH LARYNX
STEP 1
LARYNX TO SUBGLOTTIS
STEP 2
FOLLOW THE CURVE TO THE CARINA
STEP 3
CARINA TO LEFT
CARINA TO RIGHT
LEFT-RIGHT NEUTRAL
RIGHT MAIN BRONCHUS
LEFT MAIN BRONCHUS
CARINA
TRACHEAL RINGS
STEP 4
DOWN UP LEFT
DOWN UP RIGHT
STEP 5
LMB TO LUL
UPPER DIVISION
LINGULA
LMB TO LLL
LEFT LOWER LOBE
RMB TO RUL
RMB TO BI
MIDDLE LOBE BRONCHUS
MEDIAL BASAL
B8-9-10
SUPERIOR SEGMENT
RMB TO RLL
SUPERIOR SEGMENT
RLL BASAL BRONCHUS
MIDDLE LOBE BRONCHUS
STEP 6
LUL
UNO-DOS
APICOPOSTERIOR SEGMENT
ANTERIOR SEGMENT
LEFT UPPER LOBE UPPER DIVISION BRONCHUS
L B456
LEFT UPPER DIVISION BRONCHUS
LINGULAR SEGMENT (B4 5)
B6
LEFT LOWER LOBE BRONCHUS
LLL
LATERAL BASAL
ANTERIOR BASAL
SUPERIOR
POSTERIOR BASAL
LEFT LOWER LOBE BRONCHUS
RUL
UNO DOS TRES
ANTERIOR
APICAL
POSTERIOR
RB456
SUPERIOR SEGMENT (B6)
RLL BASAL BRONCHUS
MIDDLE LOBE BRONCHUS (B4 5)
RB7 (D'ARTAGNAN)
MEDIAL BASAL
STEP 7
LLL PAN-PAN-PAN
POSTERIOR BASAL
LATERAL BASAL
ANTERIOR BASAL
RLL D'ARTAGNAN AND THE 3 MUSKETEERS
LATERAL BASAL
POSTERIOR BASAL
ANTERIOR BASAL
STEP 8
HENRI COLT, M.D.
SEPTIMIU MURGU, M.D.
UNIVERSITY OF CALIFORNIA, IRVINE
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CONGRATULATIONS

You have now completed the administration of the Flexible Bronchoscopy Competency Program, an integral part of the Bronchoscopy Education Project.

Please send us your comments regarding your participation in this international endeavor by contacting your national bronchology association, emailing us at
www.bronchoscopy.org
or by contacting
Dr. Henri Colt at hcolt@uci.edu and Dr. Eric Edell at Edell@mayo.org.

If you wish to further pursue an in-depth study of bronchoscopy education, thus becoming a certified bronchoscopy trainer, please consider our Train The Trainers Program.

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