

GUIDELINE FOR THE USE OF BRONCHOSCOPY AND BRONCHOALVEOLAR LAVAGE

I. Indications for Bronchoscopy

1. Diagnostic Indications:

- a. Evaluate for possible tracheobronchial injury or bronchopleural fistula
- b. Evaluation of hemoptysis
- c. Evaluation and specimen collection for suspected ventilator-associated pneumonia (see below)

2. Therapeutic Indications:

- a. Mucous plugging with evidence of lung collapse on chest x-ray or CT scan
- b. Recent witnessed aspiration event (ideally within 30-60 minutes for therapeutic effect)
- c. Airway obstruction and/or removal of foreign body
- d. Assist with difficult intubations
- e. Adjunct during percutaneous tracheostomy

3. Bronchoscopy should **NOT** be performed for the following:

- a. Radiological finding of atelectasis on a mechanically ventilated patient
- b. Pleural effusion or hemothorax
- c. COPD exacerbation

II. Bronchoalveolar Lavage for diagnosis of Ventilator-associated pneumonia (VAP)

1. There is good microbiologic concordance and strong correlation between bronchoscopic BAL and non-bronchoscopic (i.e., blind or mini) BAL in diagnosis of VAP.
2. Because a blind BAL is less invasive with a lower risk of complications, this should be the preferred method for obtaining respiratory samples unless a bronchoscopy is being performed for separate indication(s).
3. Respiratory Therapy should perform all non-bronchoscopic BALs.
4. Indications for BAL for diagnosis of VAP:

Must meet criteria for all features in column 1 and at least one feature in column 2:

<ul style="list-style-type: none">● Mechanical ventilation >48h● Abnormal temperature (<36, >38)● Abnormal white blood cell count (<4k, >12k or >10% bands)● Macroscopically purulent sputum	<ul style="list-style-type: none">● Increasing oxygen requirements● New/changing infiltrate on CXR
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III. Bronchoscopy Technique ([video presentation here](#))

1. All bronchoscopy procedures should be supervised by a Chief Resident, Fellow, or Attending.
2. Relative contraindications to bronchoscopy include hemodynamic instability, pulmonary instability requiring high PEEP, and TBI with high ICP.
 - a. Bronchoscopy in these patients should be performed by a Fellow or Attending
3. Resident Set Up:
 - a. Verify consent
 - b. Review chest x-ray and confirm indication for bronchoscopy with Fellow or Attending

- c. Premedications:
 - i. Pain and sedation: commonly 50 mcg fentanyl and 2 mg midazolam should be used, with additional medications available for intra-procedure dosing; Consider that some patients may need higher starting doses based on their continuous infusion requirements and medication tolerance
 - ii. Local anesthetic: lidocaine can be administered directly into the ETT or via the bronchoscope port at the carina to anesthetize the airway and decrease cough
 - iii. Neuromuscular blockade: 50 mg rocuronium or appropriate alternate agent can be used *only after the patient is appropriately sedated* in select patient populations (severe ventilator dyssynchrony, high minute ventilation)
 - d. Confirm ventilator settings:
 - i. Ventilator mode with rate control
 - ii. FiO₂ at 100%, allow time for preoxygenation
 - e. Review the size of ETT or tracheostomy and choose bronchoscope size accordingly (ensure at least 2mm clearance of inner ETT to outer scope diameter)
 - f. Ensure vital monitors are visible
4. Respiratory Therapy Set Up:
- a. Confirm ventilator settings
 - b. Attach adapter to circuit
 - c. If performing BAL: 4 x 30cc sterile saline aliquots and specimen container
5. Procedure:
- a. Perform a time out (to include patient, consent, plans for BAL if indicated, sedation plan) and administer medications
 - b. BAL technique described in section IV below
 - c. Perform therapeutic bronchoscopy of remaining areas if indicated
 - d. Abort procedure if the patient becomes hypoxemic or hypotensive, and re-dose medications as indicated
6. Post-Procedure:
- a. Monitor vent settings and deescalate as indicated
 - b. Order post-procedural CXR
 - c. Complete procedure note
 - d. Start empiric antibiotics at the discretion of Fellow or Attending

IV. Bronchoscopic BAL Technique:

1. Advance the bronchoscope to the segment of interest based on CXR. Do not suction the airway until specimen is collected.
2. Instill a total of 120 mL isotonic saline (0.9% NaCl) in four aliquots of 30 mL.
3. After each aliquot, gently aspirate the fluid back into the 30 mL syringe, adjusting pressure to maintain airway patency and avoid mucosal trauma.
4. RT will collect these samples and send them for Gram stain and quantitative culture.
5. Data suggest that specimen-initiated antibiotics (given after BAL gram stain or culture results) did not result in worse outcomes compared to immediate antibiotics (given prior to BAL) in critically ill patients with suspected pneumonia.⁴ Therefore, antibiotics should be started at the

discretion of the Attending or Fellow based on clinical status of the patient and index of suspicion.

V. Diagnostic Workup of Early Pneumonia

1. Pneumonia present on admission or identified in patients intubated within 48h after admission can be seen in 30-50% of trauma patients.^{1,2}
2. Diagnosis of early pneumonia can decrease VAP rates by 25%, mostly due to reclassification as aspiration or community acquired pneumonia.
3. However, detection of bacteria in the alveolar fluid may lead to unnecessary treatment of bacterial colonization.
4. Therefore, routine, early screening BAL in the absence of other clinical signs of infection (fever, leukocytosis, chest x-ray opacities, etc.) is not recommended.

References

1. Loftus TJ, Lemon SJ, Nguyen LL, et al. Early bronchoalveolar lavage for intubated trauma patients with TBI or chest trauma. *J Crit Care*. 2017 Jun;39:78-82.
2. Harrell KN, Lee WB, Rooks HJ, et al. Early pneumonia diagnosis decreases ventilator-associated pneumonia rates in trauma population. *J Trauma Acute Care Surg*. 2023 Jan 1;94(1):30-35.
3. Nannapaneni S, Silvis J, Curfman K, et al. Bronchoscopy Decreases Ventilator-Associated Pneumonia in Trauma Patients. *Am Surg*. 2022 Apr;88(4):653-657.
4. Guidry CA, Beyene RT, Watson CM, et al. Trial of antibiotic restraint in presumed pneumonia: A Surgical Infection Society multicenter pilot. *J Trauma Acute Care Surg*. 2023 Feb 1;94(2):232-240.