I. Purpose
A. Establish practices and standards that will ensure delivery of quality care to patients requiring bronchoalveolar lavage (BAL) specimens in the adult mechanically ventilated patient who is suspicious for ventilator associated pneumonia (VAP).

II. Policy
A. Acceptable criteria for BAL are:
   1. Patient must be located in critical care area
   2. Must have an artificial airway
   3. Mechanically ventilated >48 hours
   4. Has an order for blind BAL or non-bronchoscopic bronchoalveolar lavage
   5. Stable hemodynamics
   6. No significant life threatening cardiac arrhythmias or bleeding
   7. Note: Optimal results obtained if no antibiotic changes within prior 72 hours.

B. Objectives for BAL:
   1. Intended for obtaining distal lung specimen for diagnosis of ventilator associated pneumonia using a protected catheter to prevent contamination of specimen

C. Document the time of procedure, and pre/post patient assessment including if any; hypoxemia via arterial blood gases or pulse oximetry saturation, physical signs of cyanosis or response to a medical emergency, pulse rate, respiratory rate.

D. The patient's cardiopulmonary status should be evaluated routinely to determine the dosage of oxygen required.

E. Hyperoxygenation with 1.0 FIO2 should be performed prior to, during, and post BAL ensuring an acceptable saturation.

F. Ventilator Flow Sheet documentation should be performed pre/post therapy with additional comments provided pertaining to the procedure.

G. Bronchodilator treatments may be given prior to, and post BAL at the discretion of the Respiratory Therapist.
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H. Specimens are only to be obtained by competency certified Respiratory Therapists.

III. Equipment needed are based on the catheter system being utilized by practitioner. Manufacturer recommendations apply. Either catheter system may be used by the practitioner. Note: only the Kimberly-Clark system has a directional tip.

A. Kimberly-Clark BAL Cath System
   1. BAL Cath System
   2. Non-bacteriostatic normal saline (100 ml)
   3. Pre-marked laboratory specimen slip
   4. Specimen container
   5. (3) 30ml luer-lock syringes
   6. Suction tubing
   7. Sterile Gloves and Mask
   8. One sterile surgical towel

B. CombiCath™ – 58124.40
   1. One CombiCath™ catheter (13 french Outside Diameter OD)
   2. Non-bacteriostatic normal saline (60 ml)
   3. Pre-marked laboratory specimen slip
   4. Specimen container
   5. (1) 60ml luer-lock syringe
   6. Sterile Gloves and Mask
   7. Non-sterile gloves
   8. One sterile surgical towel
   9. One 18 gauge needle
   10. One bronchoscopy airway adapter
   11. One sterile airway suction kit

VI. Procedure based on cath system being utilized by practitioner. Manufacturer recommendations apply.

A. Procedure for Kimberly-Clark BAL Cath System
   Note: Closely monitor patient throughout procedure. If patient becomes unstable the procedure should be immediately terminated and the physician notified.

   1. Locate and scan chart to determine the order, diagnosis and pertinent history and physical
   2. Confirm order for BAL
   3. The order should indicate right or left lung and specify reason for collection/specimen tests requested
   4. Tube feedings should be turned off 30 minutes prior to procedure
   5. Collect the appropriate equipment
   6. Locate and identify patient using patient identifiers
   7. Identify self and department to the patient
   8. Explain prescribed therapy to the patient
   9. Wash hands
   10. Increase FIO2 to 100%
   11. Open BAL Cath package in a sterile manner and lay on sterile field
   12. Apply mask and sterile gloves
   13. Prepare equipment
   14. Fill 30ml syringes with 20ml non-bacteriostatic normal saline
   15. Pass catheter through access port elbow until it extends beyond elbow 1.5 inches
   16. Attach access port elbow between endotracheal tube and ventilator circuit
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17. Once the adapter is secured onto the ET tube, extend the BAL Cath to the end of the ET tube
18. Match the numbers on the ET tube and BAL Cath to show when this has been achieved
19. Extend the BAL Cath 1-2cm beyond the end of the ET tube and flush the tube with 2ml sterile saline
20. Direct the catheter tip to the chosen lung by orienting the O2 port to the side of the chosen lung
21. Advance the catheter tip until about 10cm of BAL Cath protrudes beyond access port elbow Note: For trimmed or untrimmed endotracheal tubes, the catheter should protrude no more than 15cm from the patient's mouth or nose.
22. Advance the inner catheter from the outer catheter until resistance is met. The inner catheter should now be in the wedge position
23. Lock catheter in place
24. Attach 30ml luer-lock syringe to BAL Cath stop-cock and infuse 20ml non-bacteriostatic normal saline. (Not to exceed 100ml)
25. Aspirate sample by pulling sample back into syringe; remove syringe
26. Repeat #24 – 25 with a different 30ml syringe until total volume of BAL has been infused and an adequate sample volume has been obtained. Desired yield is approximately 25ml
27. Unlock catheter and retract inner catheter, then remove BAL Cath and elbow access adapter from endotracheal tube and ventilator circuit
28. Reconnect ventilator circuit to ET tube
29. Assess patient's oxygenation status and titrate to the previous oxygen setting on the ventilator as tolerated
30. Wash hands
31. Attach appropriate patient label to specimen
32. Send to lab ASAP
33. Complete appropriate documentation
34. Monitor the patients ventilatory status (PIP for any increase as an indication of a pneumothorax)

B. Procedure for CombiCath™- 58124.40
NOTE: Closely monitor patient throughout procedure. If patient becomes unstable the procedure should be immediately terminated and the physician notified.

1. Locate and scan chart to determine the order, diagnosis and pertinent history and physical
2. Confirm order for BAL. (Note: CombiCath™ is not a directional tip catheter)
3. Tube feedings should be turned off 30 minutes prior to procedure.
4. Collect the appropriate equipment
5. Locate and identify patient using patient identifiers
6. Identify self and department to the patient
7. Explain prescribed therapy to the patient
8. Wash hands
9. Increase FIO2 to 100%
10. Apply mask and sterile gloves
11. Aspirate up to 60 ml of non-bacteriostatic saline into the 60 ml syringe using aseptic technique
12. Place the bronchoscopy adapter between the circuit and artificial airway
13. Open sterile surgical towel package and place the towel over the patient's chest while only contacting the corners of the towel
14. Open the specimen container package and place the closed container on the lower end of the surgical towel
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15. Open the CombiCath catheter package and lay catheter (still in protective sheath) on the surgical towel
16. Advance the CombiCath catheter out of the protective sheath at the opened end (end with red plug) and introduce catheter into the artificial airway through the bronchoscopy adapter
17. Gently advance the catheter until resistance is met, indicating the catheter is "wedged" into a distal airway
18. **Pull the catheter out approximately 3-4 cm** to allow room for the inner catheter to be advanced
19. Remove the white plastic protective spacer that separates the inner and outer catheters
20. Gently advance the inner catheter (no resistance should be met) and connect it to the outer catheter by slightly twisting it into the outer connector
21. Connect the syringe to the catheter and briskly administer the desired lavage volume (40-60 ml) of the normal saline. **NOTE:** extreme back pressure sensed during the lavage may indicate kinking of the catheter, occlusion of the distal end by sputum or tissue and may require slight position adjustment to allow smooth flow through the catheter.
22. Aspirate lavage sample using the same (last) syringe while maintaining catheter position. **NOTE:** Extreme back pressure during the aspiration stage may indicate the distal end is occluded with thick sputum or the end may be directed into the sidewall of the airway. Slowly rotate the catheter while aspirating to enhance aspiration of lavage fluid. Do not disconnect the syringe if air is aspirated into the syringe. Simply hold the syringe in the upright position and push the air back through the catheter while keeping any aspirated lavage fluid in the syringe. Repeat the aspiration process as necessary until an appropriate specimen is obtained
23. If thick sputum is likely prohibiting proper aspiration, the inner catheter may be removed and aspiration may be attempted through the outer catheter as in step 21
24. Remove the CombiCath from the airway with the syringe still attached
25. Place the sample into the specimen container being very careful not to cause any contact contamination
26. Tightly secure the lid on the specimen container
27. Suction the patient (if indicated) using standard technique to remove excess lavage fluid
28. Place patient label on the specimen container
29. Assess patient's oxygenation status and titrate to the previous oxygen setting on the ventilator as tolerated
30. Send to Lab ASAP
31. Complete appropriate documentation
32. Monitor the patients ventilatory status (PIP for any increase as an indication of a pneumothorax)

### VII. Contraindications
A. There are no absolute contraindications but relative contraindications to this procedure include: PEEP >15cmH2O, hypoxemia, bullous emphysema, severe acidemia, increased intracranial pressure, severe coagulopathy or significant thrombocytopenia

### VIII. Hazards/Complications
A. Non-bronchoscopic bronchial alveolar lavage may be expected to have complications similar to those seen in bronchoscopic BAL procedures, which may include: pneumothorax, pneumonitis, post procedure fever, bronchospasm, hypoxemia, vomiting, aspiration, and bleeding.