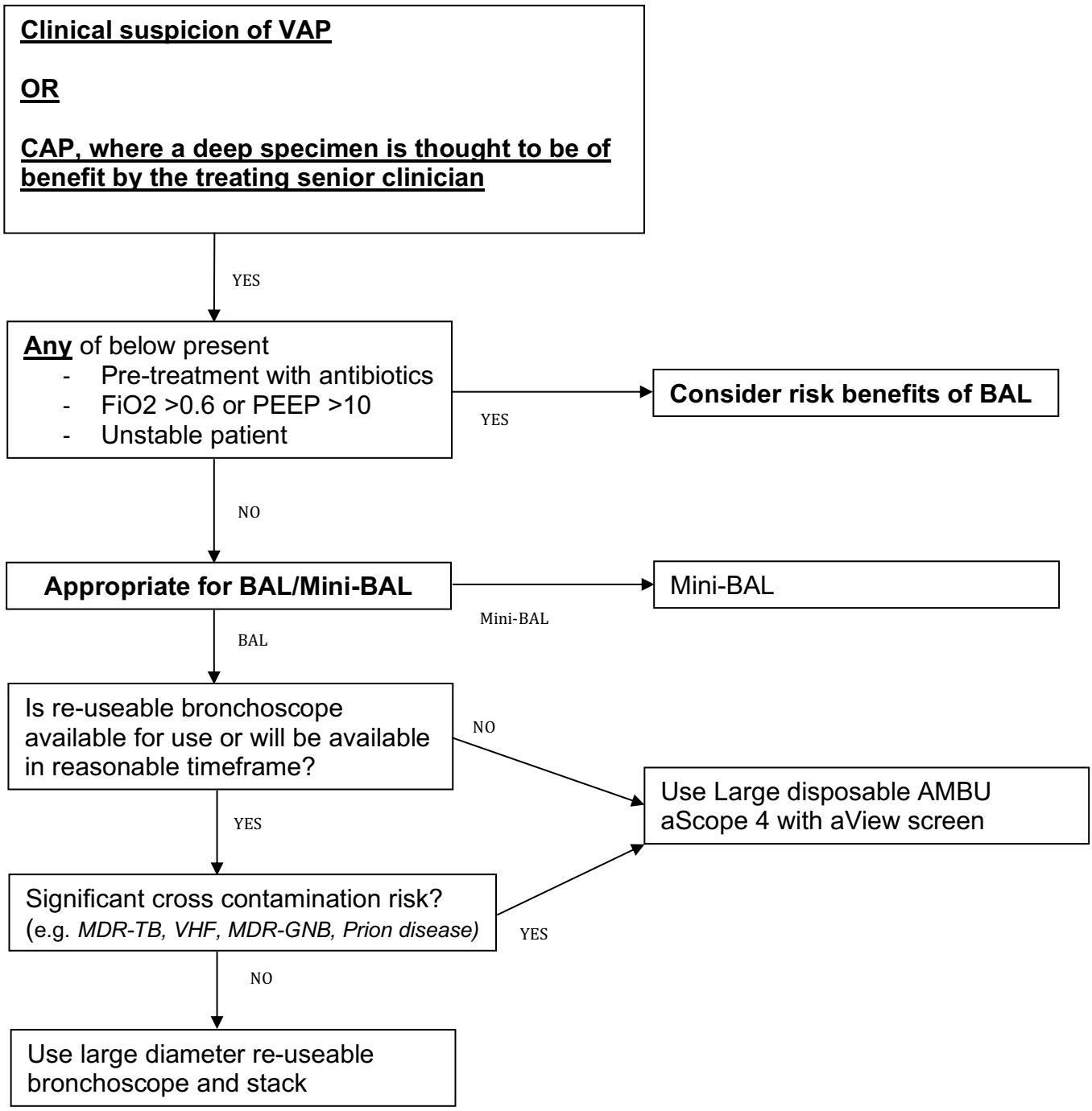
Broncho-Alveolar Lavage (BAL) & Mini-BAL standardised procedure guideline



Introduction – BAL for VAP

Ventilator acquired pneumonia (VAP) is a common condition in ICU[1] with high morbidity[2 3] but there is often diagnostic uncertainty. The consequences of inappropriate or delayed antibiotic therapy can be significant[4 5], whilst overuse of, and failure to de-escalate, antibiotic therapy can result in selection of multi-drug resistant bacteria[6] and significant morbidity such as Clostridium difficile infection[7].

There is evidence that Broncho-Alveolar Lavage (BAL) has superior specificity compared to Endo-Tracheal Aspiration (ETA) for the diagnosis of ventilator acquired pneumonia[8 9], with culture growth from ETA more likely to represent upper airway colonisation. Use of BAL results in a lower incidence of microbiologically confirmed pneumonia[10], more antibiotic free days[10]. BAL should therefore be considered the gold standard investigation. There is less evidence directly comparing BAL and mini-BAL – if the patient is too unstable or there will be a significant delay in performing BAL (e.g. experienced bronchoscopist not available) then it may be appropriate to perform a mini-BAL.

Indications for BAL in VAP from ECDC HAI-Net ICU protocol v2.2

3.3 Pneumonia (PN 1–PN 5)

X-ray

Two or more serial chest X-rays or CT-scans with a suggestive image of pneumonia for patients with underlying cardiac or pulmonary disease* (in patients without underlying cardiac or pulmonary disease, one definitive chest X-ray or CT-scan is sufficient).

Symptoms

and at least one of the following:

- fever > 38 °C with no other cause
- leukopenia (< 4 000 WBC/mm3) or leucocytosis (≥ 12 000 WBC/mm3).

and at least one of the following (or at least two, if clinical pneumonia only = PN 4 and PN 5):

- new onset of purulent sputum, or change in character of sputum (colour, odour, quantity, consistency)
- cough or dyspnea or tachypnea
- suggestive auscultation (rales or bronchial breath sounds), rhonchi, wheezing
- worsening gas exchange (e.g. O_2 desaturation or increased oxygen requirements or increased ventilation demand)

and

according to the used diagnostic method:

Microbiology

Relative contraindications

Pre-treatment with antibiotics
FiO2 >0.6 or PEEP >10
Unstable patient (eg, high dose vasopressors/inotropes, arrhythmias, etc)

Procedural guidelines - BAL

Selection of bronchoscope (will depend on unit working within & availability)

1. Re-usable large diameter bronchoscope with appropriate stack
   Once removed from cabinet must be used within 1 hour or re-sterilized

   Or if unavailable/emergency

2. Single use AMBU aScope 4 (ensure selected large size) with portable monitor

Preparation

- Review CXR and choose segment to be lavaged as below:
    1. Segment involved on CXR
    2. If 1. difficult to predict, then choose segment where pus seen at bronchoscopy
    3. If pus not seen then lavage posterior segment of RLL
- Ensure adequate ongoing anaesthesia and neuro-muscular blockade
- Volume controlled ventilation mode (consider adjusting pressure alarms/disabling autoflow)
- Pre-oxygenate and ensure FiO2 1.0 with PIFR <60L/min
- Change to a sterile catheter mount
- Trolley with sterile field containing:
    - Sterile traysin – decant sterile saline from 1L bottle
    - 20ml syringes x 8
    - At least two large sterile suction traps
- New suction tubing connected to bedside suction

Procedure

- Don appropriate PPE (consider Jupiter hood/FFP3 mask), scrub, gown, and glove
- Do not use local anaesthetic – *it is bactericidal*
- Attach sterile suction trap to bronchoscope and suction tubing
- Maintaining sterility, pass scope down ETT to desired area of lung avoiding use of suction
- Wedge the scope in a sub-segment and apply gentle suction – visualised lung should collapse
- Inject 20ml sterile saline, aspirate and discard this sample
- Keeping scope wedged in same position, change suction trap
- Inject 20ml aliquots of saline to a maximum total of 120mls (stop if resistance to injection or falling SpO2)
- Allow sample to rest for 10-20 seconds
- Keeping suction trap upright, gently suction BAL fluid into trap (NB/ average return is <20% - cadence suctioning can help improve return)
- Remove trap and seal with sterile top
- Visualise the rest of bronchial tree and perform further sampling if appropriate (note published evidence supports a single sample as described above)
- Document procedure in notes

Directorate of Critical Care

Procedural guidelines – Mini-BAL

Preparation

- Review CXR and choose side to be lavaged
- Ensure adequate ongoing anaesthesia and neuro-muscular blockade
- Volume controlled ventilation mode (consider adjusting pressure alarms/disabling autoflow)
- Pre-oxygenate and ensure FiO2 1.0 with PIFR <60L/min
- Change to a sterile catheter mount
- Trolley with sterile field containing:
    - Sterile traysin – decant sterile saline from 1L bottle
    - 20ml syringes x 5
    - At least two large sterile suction traps
- New suction tubing connected to bedside suction

Procedure

- Don appropriate PPE (consider Jupiter hood/FFP3 mask), scrub, gown, and glove
- Do not use local anaesthetic – *it is bactericidal*
- Open dressing pack and drape
- Remove BAL catheter
- Remove protective cover from tip of BAL catheter
- Attach 20 ml syringe, with saline to 3-way tap
- Flush catheter deadspace with 4-5 ml saline
- Attach connector between catheter, sputum trap & suction apparatus
- Insert BAL catheter into catheter mount approximately 2-4cm
- Position the catheter for right or left side (O_2 port on same side)
- Advance BAL catheter maintaining correct direction to just beyond tracheal tube (cm. markings match)
- Advance 3-5cm, flush tip with 2 ml saline
- Advance inner catheter into wedge position (slight resistance)
- Lock catheter position by sliding blue mechanism
- Instill Saline in 20 ml aliquots down catheter to maximum of 120ml (stop if resistance to injection or falling SpO2)
- Gently suck lavage fluid into sputum trap
- Unlock the catheter by sliding blue mechanism
- Remove BAL catheter, withdraw inner catheter first followed by both together
- **Clearly label as 'mini-BAL sample'**
- Document procedure in notes
- **Interpret culture results with a 10^3 CFU /ml cut-off for positivity (normal BAL is ≥ 10^4 CFU)**

Sending samples & consideration of antimicrobials

- Refer to HAP/VAP protocol and anti-microbial guidelines

- Separate the sample in a sterile fashion into
  - Gram stain and quantitative culture (C&S)
  - Virology
  - Mycology
  - Acid fast bacilli culture/staining
  - Cytology (if indicated) [NB/ must also complete a paper cytology request form and include with sample]
- Print two sets of labels and stick second set on green micro sheet in patient folder / Document samples sent as micro TRAK entry
- **Send BAL fluid urgently via porter (cannot be sent via pneumatic tube "pod" system)**
- **Warn the labs that specimens are coming (micro technician via switchboard)**

Results

- Document results (including gram stain) as TRAK micro entry
- Quantitative culture is significant if $>10^4$ colony forming units (cfu)/ml of fluid are present ($>10^3$ colony forming units (cfu)/ml if Mini-Bal is used)
- Antimicrobials should be reviewed on the basis of results
- A negative culture should prompt consideration of cessation of antimicrobials

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