SSM Health Cardinal Glennon Children's Hospital

# Ventilator & Artificial Airway-Associated Tracheitis and Pneumonia

**Evaluation and Management**
**Clinical Practice Guideline**

March 2025

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# Evaluation and Management of Ventilator and Artificial Airway-Associated Tracheitis (VAT) and Ventilator and Artificial Airway-Associated Pneumonia (VAP)

**SSMHealth Cardinal Glennon Access Center Transfer Line**
**888-229-2424**

1. SSMHealth Cardinal Glennon CPG Home

2. Resources
a. Tamma PD, et al. Ventilator-Associated Tracheitis in Children: Does Antibiotic Duration Matter? *Clin Infect Dis*. 2011 June; 52(11):1324-31.
b. Ormsby J, et al. Practice Improvement for Standardized Evaluation and Management of Acute Tracheitis in Mechanically Ventilated Children. *Pediatr Qual Saf*. 2020 Dec 28; 6(1):e368.


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## DEFINITIONS AND GOALS

- **Definition of Ventilator and Artificial Airway-Associated Tracheitis (VAT):**
  Ventilator and Artificial Airway-Associated Tracheitis (VAT) is the presence of clinical signs of purulent tracheal discharge, fevers, respiratory distress, and the presence of bacteria and white blood cells in the tracheal aspirate without radiological signs of pneumonia. In some cases, VAT can be an obstructive process that leads to hypoxia and respiratory distress (also sometimes referred to as ventilator-associated tracheobronchitis)

- **Definition of Ventilator and Artificial Airway-Associated Pneumonia (VAP):**
  Ventilator-Associated Pneumonia (VAP) is a new or progressive infiltrate on chest imaging with associated signs and symptoms of infection (e.g., new onset of fever, purulent sputum, leukocytosis, decline in oxygenation, altered respiratory mechanics) in a patient mechanically ventilated for ≥ 48 hours

- **Goals of this Clinical Practice Guideline**
  Decrease the utilization of broad-spectrum antibiotic usage in patients with VAT and VAP by decreasing inappropriate diagnoses, optimizing empiric antibiotic regimens, and minimizing unnecessarily prolonged antibiotic courses

## PATIENT MUST MEET ALL OF THE FOLLOWING CRITERIA:

- Inpatient* at SSM Health Cardinal Glennon Children's Hospital
- Age > 2 months
- Intubated or have a surgical tracheostomy in place ≥ 48 hours
- New onset increase in quantity of tracheal secretions (isolated change in color or thickness does not qualify)
- Must have one or more of the following:
  1) Temperature abnormality (> 38 C or < 36 C)
  2) Peripheral WBC abnormality (> 12k or < 4k)
  3) Change in ventilator settings
     - PIP or PEEP change of > 2 OR absolute increase in FiO2 of > 20% from baseline for more than 4 hours
     (example: baseline is 30% FiO2, now requiring 50% FiO2 for more than 4 hours)

* = Although this clinical guideline was primarily designed to address inpatients with VAP and VAT, it may serve as a helpful guide to assess outpatients and ED patients who have an artificial airway where there is concern for VAT

## EXCLUSION CRITERIA

- Age ≤ 2 months
- Intubated or Surgical tracheostomy in place for less than 48 hours
- Clinical evidence of sepsis or otherwise clinically unstable
- Patient does not meet all criteria outlined above
- Immunocompromised patient

**Does the patient have a decline in respiratory status AND A new or progressing infiltrate on CXR?**

Note: The majority of patients on this clinical pathway should have had recent chest imaging; however, imaging may not be indicated for a small subset of patients

YES

### CONCERN FOR VAP

- Evaluate previous tracheal aspirate cultures (if available)
  - Recommend targeting organisms isolated within the past 90 days
  - If no result within the past 90 days, it is reasonable to target organisms isolated up to 6-12 months prior to current illness
- Obtain a tracheal aspirate for gram stain and culture (if one has not been obtained in the last 72 hours)
  - Order "Culture Respiratory and Gram Stain". Do not order "Culture Cystic Fibrosis Pulmonary" unless patient has cystic fibrosis
- Consider a respiratory pathogen panel PCR
  - Patients in this context with a positive RPP may not require any antibiotic therapy; decision to obtain and treat will depend on the clinical judgement of the treating physician
- Initiate empiric antibiotics
  No prior culture result available:
  Cefepime 50mg/kg IV every 8 hours (max 2g per dose)

  If history of cefepime-resistant organism:
  Meropenem 20mg/kg IV every 8 hours (max 2g per dose)

  If severe cephalosporin allergy:
  Levofloxacin 10mg/kg IV/PO
  Every 12 hours if 6 months to 5 years of age
  Every 24 hours if > 5 years of age

  Add additional coverage in certain circumstances:
  - MRSA Coverage (Vancomycin, linezolid, or ceftaroline) if known coloniation with MRSA or a culture positive for MRSA in the past 90 days or presence of parapneumonic effusion
  - Empiric coverage for certain beta-lactam resistant organisms grown on prior culture (e.g. TMP-SMX for *Stenotrophomonas maltophila*)
- Consult Pediatric Infectious Diseases if known or suspected multi-drug resistant organism

**Tracheal Aspirate Culture and Susceptibilities Result and Clinical Response**

- Narrow antibiotics based on culture and susceptibility results and clinical response
- Treatment duration based on isolated organism species:
  1. Non-fermenting Gram-negative organisms (*P. aeruginosa*, *Acinetobacter spp*, *Burkholderia spp*, and *Stenotrophomonas maltophilia*)
     - Treat for 10-14 days
  2. All other organisms
     - Treat for 7 days
  3. Coagulase-negative *Staphylococci* (CoNS), *Enterococcus spp*, and *Candida spp*
     - Generally not clinically relevant, do not require treatment unless immunocompromised patient or infants with extreme prematurity
- Consult Pediatric Infectious Diseases for:
  - Multi-drug resistant organism isolation
  - Any patient requiring repeat courses of broad-spectrum antibiotics for VAT or VAP, especially in cases where it is difficult to distinguish pathogens versus colonizers on culture results
  - No clinical response to therapy or worsening on therapy

NO

**Gram Stain with Presence of: Moderate to Heavy PMN's *AND* Organisms**

NO

- Empiric antibiotics not indicated, continue routine respiratory hygiene
- If respiratory symptoms persist, consider alternative diagnoses and further clinical assessment, including:
  - CBC, CRP, procalcitonin
  - Imaging
  - Respiratory cultures

YES

### CONCERN FOR VAT

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  - Order "Culture Respiratory and Gram Stain". Do not order "Culture Cystic Fibrosis Pulmonary" unless patient has cystic fibrosis
- Consider a respiratory pathogen panel PCR
  - Patients in this context with a positive RPP may not require any antibiotic therapy; decision to obtain and treat will depend on the clinical judgement of the treating physician
- Evaluate previous tracheal aspirate cultures (if available)
  - Recommend targeting organisms isolated within the past 90 days
  - If no result within the past 90 days, it is reasonable to target organisms isolated up to 6-12 months prior to current illness
- Initiate empiric antibiotics
  No prior culture result available:
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  Add additional coverage in certain circumstances:
  - MRSA Coverage (Vancomycin, linezolid, or ceftaroline) if known coloniation with MRSA or a culture positive for MRSA in the past 90 days
  - Empiric coverage for certain beta-lactam resistant organisms grown on prior culture (e.g. TMP-SMX for *Stenotrophomonas maltophila*)
- Consult Pediatric Infectious Diseases if known or suspected multi-drug resistant organism

**Tracheal Aspirate Culture and Susceptibilities Result and Clinical Response**

| Positive Culture Result AND Patient Clinically Improves/Responds to Therapy | Positive Culture Result AND Patient Worsening or Not Responding to Therapy | Negative Culture Result OR Normal Oropharyngeal Flora |
|---|---|---|
| • Complete a 5 day course of antibiotic with appropriate antibiotic with activity against organisms on trach culture (only count days when antibiotic used had appropriate coverage)<br>• Consult Pediatric Infectious Diseases for:<br>- Multi-drug resistant organism isolation<br>- Any patient requiring repeat courses of broad-spectrum antibiotics for VAT, especially in cases where it is difficult to distinguish pathogens versus colonizers on culture results | • Re-assess diagnosis of VAT<br>• Consider:<br>- Repeat labs to assess WBC or CRP trend<br>- Repeat chest imaging to look for VAP or complicated pneumonia<br>- Repeat tracheal aspirate culture or BAL<br>- Prolonging the antibiotic course, expanding antibiotic spectrum<br>• Consult Pediatric Infectious Diseases | • Consider discontinuing antibiotics<br>• If respiratory symptoms persist, consider alternative diagnoses and further clinical assessment as indicated, including:<br>- CBC, CRP, procalcitonin<br>- Imaging<br>- Respiratory cultures<br>• Consult Pediatric Infectious Diseases for:<br>- Patient worsening or not responding to therapy<br>- History of multi-drug resistant organism isolation<br>- Any patient requiring repeat courses of broad-spectrum antibiotics for VAT, especially in cases where it is difficult to distinguish pathogens versus colonizers on culture results. |