

1 Presentation

VAP window: >48 h after intubation

Early onset
<5 days in hospital

Late onset
≥5 days in hospital → consider MDR risk

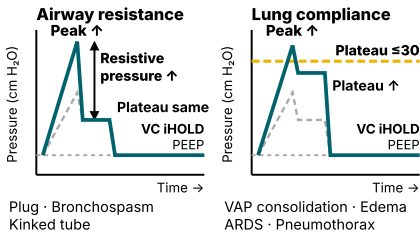
Systemic Cytokines
Temp >38 or <36 °C

WBC ≥12k or ≤4k
± Left shift (↑ bands)

Local Neutrophils
Purulent secretions

Gas exchange Shunt
Oxygenation worsens
Needs more FiO₂ or PEEP · VAE ≠ VAP

Bedside: pressure-time waveforms



Predisposing

Aspiration past the cuff
Reintubation
TF via NGT
Impaired consciousness

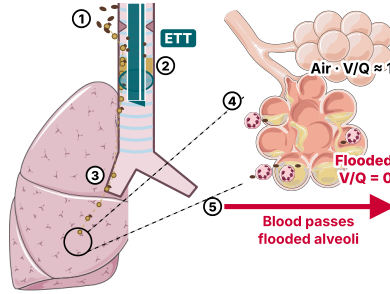
Colonization
H₂ blocker · Prior antibiotics

Defenses and time
Tracheostomy · Longer intubation
Neuromuscular blocker

Host · COPD · Trauma
Immunocompromised

New deterioration on the ventilator: weigh infection, mechanics and other causes; findings may evolve separately.

2 Mechanism



④ Cytokines

IL-1, IL-6, TNF-α →
hypothalamus ↑ set point = fever
Marrow → WBC ↑↓, bands ↑

④ Exudate

Bacteria → neutrophils +
fluid fill alveoli → pus
→ purulent secretions

⑤ Shunt

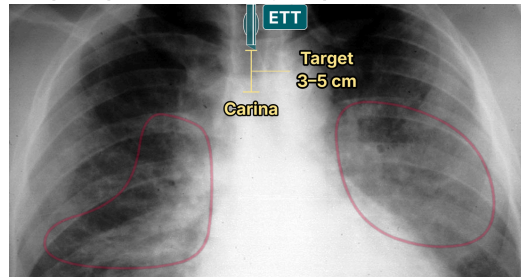
Blood flows past flooded
alveoli → V/Q = 0
→ ↓ PaO₂ (FiO₂ helps little)

V = ventilation · Q = perfusion

Microaspiration seeds bacteria; inflammation floods the alveoli.
Drive · Strength · Flow (tube, airway, alveoli)

3 Diagnostics

Air-space opacities (illustrative, nonspecific)



Clinical suspicion

New or progressive infiltrate + ≥2 of 3:
Fever >38 °C · WBC ↑↓ · Purulent secretions

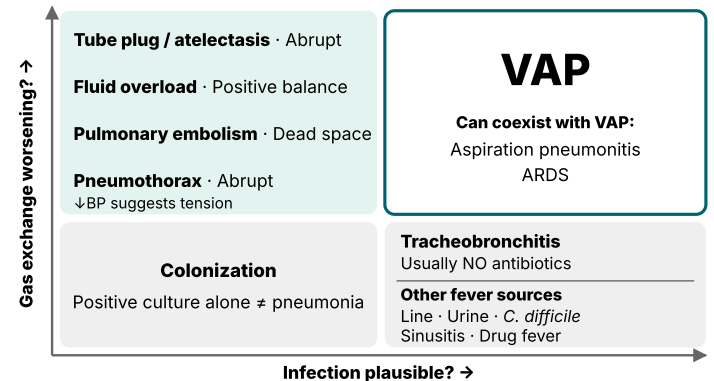
Arterial blood gas + SpO₂

P/F ratio ↓ = oxygenation impaired
Poor FiO₂ response suggests shunt

Cultures and Gram stain: see panel 5

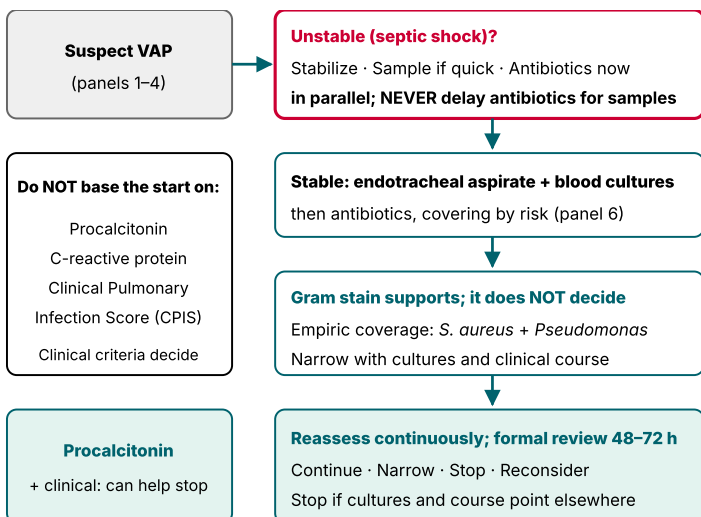
Infiltrate plus clinical signs raise suspicion; an endotracheal aspirate before antibiotics tests it.

4 Differential



Exclude tube problems and pneumothorax first; the axes are questions, and processes can overlap.

5 Decision



Culture first when safe; cover by risk; let cultures and course narrow.

6 Management

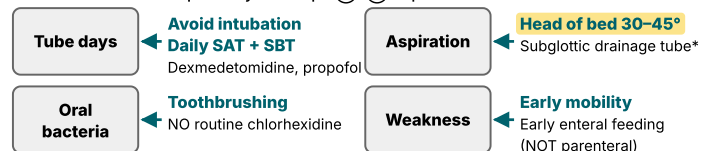
Empiric antibiotics · Choose ONE drug per row

Add each row separately if: IV antibiotics ≤90 days · High mortality risk · Late onset

BASE: Antipseudomonal β-lactam	Piperacillin-tazobactam (penicillin + BLI) Cefepime (4th-gen cephalosporin) Meropenem (carbapenem)
+ MRSA coverage	Vancomycin (glycopeptide) · Linezolid (oxazolidinone)
+ 2nd antipseudomonal	Levofloxacin (fluoroquinolone) Ciprofloxacin (fluoroquinolone) Amikacin (aminoglycoside)

7 days usual; review by response **Key: Pseudomonas · S. aureus (MSSA or MRSA)**

Prevention · Different pathways to steps ①-③ in panel 2



NOT for VAP prevention: probiotics, stress-ulcer prophylaxis · *additional practice

Cover by risk, then narrow; prevention cuts exposure, aspiration and ventilator time.