

VAP and HAP Prevention and Management

A plain-English guide for you and your family

WHAT IS HAPPENING

Your lungs normally have tough defenses: the windpipe has tiny hairs that sweep germs up and out, and you cough automatically to clear mucus. In the hospital, especially when a breathing tube is placed through the mouth into the windpipe, those defenses are bypassed. Germs from the mouth, stomach, or even the hospital room can slide down around the tube and land in the lower airways, where they multiply and cause a new lung infection. This is called hospital-acquired pneumonia if it starts after 48 hours in the hospital, or ventilator-associated pneumonia if it happens on a breathing machine. The body fights back by flooding the lungs with white blood cells and fluid to trap and kill the germs, but that inflammation shows up as fever, thick mucus, low oxygen, and a new white spot on the chest X-ray. Doctors prevent it by keeping the head of the bed raised so stomach contents do not flow backward, brushing teeth twice a day to lower mouth germs, waking patients daily to reduce heavy sedation (which weakens coughing), and removing the breathing tube as soon as it is safe. Treatment starts with strong antibiotics that cover tough hospital bugs like MRSA (a resistant Staph) and Pseudomonas (a resistant Gram-negative germ), then the team narrows the antibiotics once lab cultures show exactly which germ is present, usually by 48–72 hours.

What you might feel

- New or worsening cough with coughed-up mucus (sputum) (thick mucus you cough up from the lungs)
- Fever (body temperature above 100.4 °F or 38 °C)
- New or worse shortness of breath or faster breathing
- Low oxygen level in the blood (hypoxemia) when checked with a pulse oximeter or blood gas
- New cloudy or white patches on chest X-ray (infiltrates)
- Higher white blood cell count or a rise in certain inflammatory markers (like C-reactive protein)

- Confusion or sudden change in mental status (especially in older adults)
- Fast heart rate (tachycardia, often over 100 beats per minute)

Call the doctor right away if...

- Oxygen level below 90 % on room air or needing high amounts of supplemental oxygen
- Blood pressure dropping below 90/60 mm Hg (septic shock from bacteria spreading into the bloodstream)
- Needing a ventilator or worsening respiratory failure despite treatment
- Confusion, drowsiness, or inability to stay awake
- Urine output falling sharply (sign that kidneys are shutting down from low blood flow)

What the care team will do

- Keep the head of the bed elevated 30 to 45 degrees at all times unless a medical reason prevents it
- Perform oral care with chlorhexidine 0.12% solution swabs or rinse twice daily, morning and evening
- Administer the first dose of antibiotics within 1 hour of pneumonia diagnosis, using piperacillin-tazobactam 4.5 g IV every 6 hours OR cefepime 2 g IV every 8 hours as ordered
- Add vancomycin 15 to 20 mg/kg IV every 8 to 12 hours if the patient has MRSA risk factors: prior MRSA infection, recent broad-spectrum antibiotics, or severe sepsis
- Suction oral secretions above the endotracheal tube cuff every 2 to 4 hours using subglottic suctioning if the tube has a suction port
- Conduct a spontaneous breathing trial daily if the patient is stable, turning off sedation and lowering ventilator support to see if they can breathe independently
- Monitor oxygen saturation continuously and report if SpO2 drops below 90 percent or the patient needs higher oxygen settings
- Watch for new confusion, low blood pressure below 90 systolic, or urine output less than 30 mL per hour and notify the provider immediately

Medicines you may be given — and why

Piperacillin-tazobactam (Zosyn)

Piperacillin punches holes in the walls bacteria build to protect themselves. Tazobactam blocks the scissors (enzymes called beta-lactamases) that many bacteria use to cut apart penicillin-type drugs. Together, they kill a wide range of bacteria, including *Pseudomonas* (a common,

tough hospital germ) and other Gram-negative rods that often cause pneumonia in the hospital or on a breathing machine.

Cefepime (Maxipime)

Cefepime punches holes in bacterial walls just like piperacillin does, but it is shaped to sneak past some of the defenses bacteria use. It covers a wide range of Gram-negative bacteria (like *Pseudomonas* and *E. coli*) and many Gram-positive bacteria, making it a strong choice when you do not yet know which exact germ is causing the pneumonia.

Meropenem (Merrem)

Meropenem is one of the strongest wall-busting antibiotics. It kills nearly all common bacteria that cause hospital pneumonia, including many that resist other drugs. Carbapenems are shaped to dodge most of the scissors (beta-lactamases) bacteria use, so they work even when penicillins and cephalosporins fail.

Gentamicin or Tobramycin

These drugs slip inside bacteria and jam the machinery (ribosomes) that bacteria use to read their instruction manual and build proteins. Without proteins, the bacteria cannot survive. Aminoglycosides are often added to a beta-lactam when the infection is severe or caused by tough bacteria like *Pseudomonas*, because the two types of drugs attack different parts of the bacteria and work together to kill faster.

Vancomycin (Vancocin)

Vancomycin blocks the building of bacterial cell walls, but only in Gram-positive bacteria (bacteria with thick walls). It is added when MRSA (methicillin-resistant *Staphylococcus aureus*) is suspected, because MRSA is resistant to most other common antibiotics and is a frequent cause of severe hospital pneumonia.

Linezolid (Zyvox)

Linezolid jams the ribosomes (protein factories) of Gram-positive bacteria, including MRSA and vancomycin-resistant enterococci. It is an alternative when vancomycin cannot be used or is not working. Linezolid reaches excellent levels in the lungs, making it especially useful for pneumonia.

Where this information comes from

- IDSA/ATS 2016 Hospital-Acquired Pneumonia and Ventilator-Associated Pneumonia Guidelines
- CDC Healthcare-Associated Infections (HAI) prevention resources

- Cochrane systematic reviews on VAP prevention bundles
- American Thoracic Society (ATS) clinical practice standards

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