Management of Adults with Hospital-acquired pneumonia, Ventilator-associated pneumonia, Ventilator associated tracheobronchitis and Healthcare-associated pneumonia

Definitions:

Lower respiratory tract infection definition: An acute illness (present for 21 days or less), usually with cough as the main symptom, with at least one other lower respiratory tract symptom (sputum production, dyspnea, wheeze or chest discomfort/pain) and no alternative explanation (e.g. sinusitis or asthma).

Hospital-acquired pneumonia (HAP) (nosocomial pneumonia): Is defined as pneumonia that occurs ≥ 48 h after admission that did not appear to be incubating at the time of admission.

Ventilator associated pneumonia (VAP): VAP is defined as a type of HAP that develops >48 h after endotracheal intubation.

Ventilator-associated tracheobronchitis (VAT): VAT is defined as the presence of all of the following in a patient endotracheally intubated and receiving mechanical ventilation for > 48 hours: body temperature > 38.3 °C or < 36.0 °C, new or increased purulent tracheal secretions, positive culture of tracheal secretions at a concentration of ≥ 10^5 cfu/ml, and no new or progressive infiltrate on portable chest radiograph.

Health care–associated pneumonia (HCAP): A relatively new clinical entity, is defined as pneumonia that occurs in a non hospitalized patient with extensive health care contact, as defined by 1 of the following modes:

- Intravenous therapy (including antibiotics), wound care, or intravenous chemotherapy during the prior 30 days,
- Residence in a nursing home or other long-term care facility,
- Hospitalization in an acute care hospital for 2 days or more during the prior 90 days, or
- Attendance at a hospital or hemodialysis clinic during the prior 30 days.

Time of onset:

Early-onset HAP and VAP is defined when HAP and VAP occurs within **the first 4 days** of hospitalization.

Late-onset HAP and VAP is defined when HAP and VAP occurs on the **5th day or more** form hospitalization. Early onset HAP and VAP tends to carry a better prognosis than does late-onset HAP and VAP; the latter tends to be associated with multidrug resistant (MDR) organisms and so is characterized by higher mortality rates.

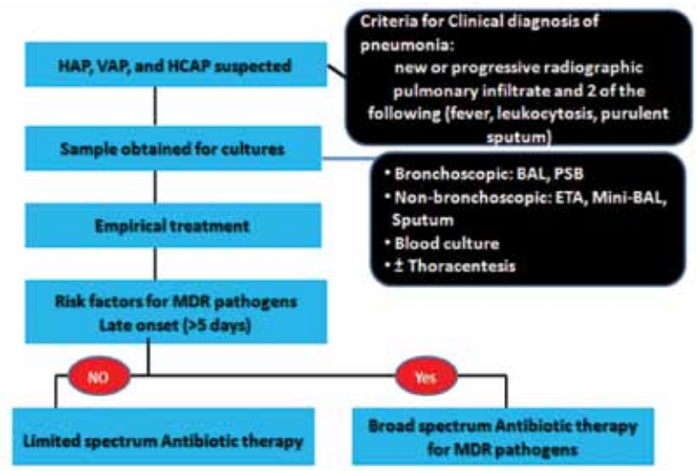

Figure 1: Algorithm for initiating empiric antibiotic therapy for HAP, VAP and HCAP

Risk Factors for Multidrug-Resistant Pathogens causing HAP, HCAP and VAP

- Antimicrobial therapy in preceding 90 d.
- Current hospitalization of 5 d or more.
- High frequency of antibiotic resistance in the community or in the specific hospital unit.
- Presence of risk factors for HCAP:
  Hospitalization for 2 d or more in the preceding 90 d
  Residence in a nursing home or extended care facility
  Home infusion therapy (including antibiotics)
  Chronic dialysis within 30 d
  Home wound care
  Family member with multidrug-resistant pathogen
- Immunosuppressive disease and/or therapy.

Specific risk factors

- Pseudomonas aeruginosa: prolonged ICU stay, corticosteroid therapy, previous antibiotic treatment, structural lung disease.
- Staphylococcus aureus: coma, craneoencephalic trauma, diabetes mellitus, renal failure.
- Methicillin-resistant Staphylococcus aureus (MRSA): previous MRSA colonization, prolonged hospital stay, previous antibiotic consumption, undergone invasive procedures (e.g. surgery, catheters, intravascular devices), weakened immune system, severe illness.
- Streptococcus pneumoniae: previous use of antibiotics in the last three months, contact with children with respiratory infections
- Legionella: treatment with high doses of corticosteroids, neoplasms (especially hematologic).
- Anaerobes: recent abdominal surgery, witnessed aspiration.

Modified from the ATS Guidelines, 2005, Modified from Campbell et al., 1996

Illness	Antibiotic Therapy
HAP or VAP in patients with no risk factors for MDR pathogens, Early-onset and Any Stage of Severity	3rd generation Cephalosporin Or Levofloxacin Or Ertapenem
HAP, HCAP or VAP in patients with Late-onset or risk factors for MDR pathogens and Any Stage of Severity	Antipseudomonal cephalosporin (Ceftazidime or Cefepime) or Carbapenem (Imipenem, Meropenem) or β-Lactam/ β-lactamase inhibitor (Piperacillin-tazobactam) Plus Antipseudomonal fluoroquinolone# (Ciprofloxacin, Levofloxacin) or Aminoglycoside (Amikacin, Gentamicin) Plus Teicoplanin or Vancomycin or Linezolid ‡

If an ESBL+ strain, such as K. pneumoniae, or an Acinetobacter species is suspected, a carbapenem is a reliable choice. If L. pneumophila is suspected, the combination antibiotic regimen should include a macrolide (e.g., azithromycin) or a fluoroquinolone (e.g., ciprofloxacin or Levofloxacin) should be used rather than an aminoglycoside.

‡ If MRSA risk factors are present or there is a high incidence locally.

Recommended Adult Doses and Intervals for the Main Intravenous Antibiotics Recommended in the Treatment for HAP, HCAP and VAP

Antibiotic	Dose	Interval	Perfusion Time
Ceftriaxone	1 g	Every 12 h	½–1 h
Ceftazidime	2 g	Every 8 h	2–3 h
Cefepime	2 g	Every 8 h	2–3 h
Imipenem	500 mg to 1 g	Every 6–8 h	2–3 h
Meropenem	500 mg to 1 g	Every 6–8 h	2–3 h
Ertapenem	1g	Every24 h	½–1 h
Piperacillin-tazobactam	4.5 g	Every 6 h	2–3 h
Amikacin	15 mg/kg	Every 24h	½–1 h
Gentamicin	7 mg/kg	Every 24h	½–1 h
Levofloxacin	500mg	Every12 h*	½–1 h
Ciprofloxacin	400 mg	Every 8 h	½ h
Vancomycin	15 mg/kg	Every 12 h	1–3 h
Linezolid	600 mg	Every 12 h	1 h
Teicoplanin	Loading dose: 400 mg Maintenance dose: 400 mg	Every 12 h for the first three doses Every 24 h	½ h ½ h

Dosages are based on normal renal and hepatic function. *Administer this dose for 3 days and then continue with 500 mg every 24 h.