

Challenges for Nurses Working at Critical Care Unit at Newly Established Tertiary Care Cancer Centre - Ventilator Associated Pneumonia Nursing Care

R Surendra Naik¹, Avadhesh Kumar Yadav²,
Rajendra Kumar Sahu³, Ram Niwas Sharma⁴

Abstract

Introduction: Nosocomial pneumonia associated with mechanical ventilation (due to endotracheal tube or tracheostomy) develops within 48 hrs. or more than 48 hrs. **Epidemiology:** VAP occurs in 10-65% of all ventilated cases, Hospital-acquired pneumonia (HAP) is the second most common hospital infection., 90% of all nosocomial infections occurring in ventilated patients are types of pneumonia. The Indian study indicates the incidence of VAP is 57.14% and the incidence density of VAP was 31.7/1000 ventilator days, another study indicates the VAP rate was 6.242/ 1000 ventilator days. The mortality rate ranged from 16.2% to 74.17%. The highest mortality rate was reported from a study in India. **Pathogens:** Staphylococcus aureus (44%) are the most frequently isolated microbes. Acinetobacter baumannii (30%), Pseudomonas aeruginosa (12%), Stenotrophomonas maltophilia (7%), Klebsiella pneumoniae (6%), and Serratia marcescens (2%) were isolated from the transtracheal aspirates or bronchoalveolar lavage in patients with VAP. **Types of pneumonia:** Community-acquired pneumonia, Hospital-acquired pneumonia, and Ventilator-associated pneumonia Common signs and symptoms are Difficulties in breathing, Tachycardia Fever, Sweating, Shivering, Loss of appetite, Pain in the chest, Hemoptysis, Headache, Fatigue, Nausea, **Vomiting Complications:** Septicemia, Lung abscess, Acute respiratory distress syndrome (ARDS), Middle ear infection, Blood infection, Meningitis, Sepsis, Pericarditis, Atelectasis, Pleural effusion, Hypotension, Tachypnea, Confusion, Septic shock, Decreases in breath sounds, and Unequal chest expansion. **Conclusion:** Nurses play a key role in the intensive care unit, they need to know about VAP, they have to Conduct a Physical examination of the patient and clinical pulmonary infection score (CIPS) to be recorded. they Check vital signs (Temperature, Pulse, Respiration, Blood pressure, and oxygen saturation. Assist the intensivist in the assessment of Progression of infiltrate. They are responsible for the Management of a patient with pneumonia by providing quality nursing care.

Keywords: Nosocomial pneumonia; VAP; HAP; HAI.

Introduction

Nosocomial pneumonia associated with mechanical ventilation (due to endotracheal tube or tracheostomy) develops within 48 hrs. or more than 48 hrs. of admission and which was not present at the time of admission.¹ Nosocomial pneumonia is associated with mechanical ventilation (due to

endotracheal tube or tracheostomy). Nosocomial pneumonia is characterized by the presence of a new or progressive infiltrate, signs of systemic infection (fever, altered white blood cell count), changes in sputum characteristics, and detection of a causative agent.²

Author Affiliation: ¹Nursing Officer, Surgical Intensive Care Unit, ²Nursing Officer B at Operation Theater, ³Nursing officer A at Recovery ICU, ⁴Nursing Officer B at Operation Theater, Maha Mana Pandit Madan Mohan Malaviya Cancer Centre, Varanasi, Uttar Pradesh 221005, India.

Correspondence Author: Rajendra Kumar Sahu, Nursing officer A at Recovery ICU, Maha Mana Pandit Madan Mohan Malaviya Cancer Centre, Varanasi, Uttar Pradesh 221005, India.

E-mail: gloriousdhamtari@gmail.com

Epidemiology

- VAP occurs in 10-65% of all ventilated cases, Hospital-acquired pneumonia (HAP) is the second most common hospital infection.
- 90% of all nosocomial infections occurring in ventilated patients are types of pneumonia.
- European study indicates the incidence of VAP is 8.0% and the incidence density: 12.3/1000 ventilator days.²
- The Indian study indicates the incidence of VAP is 57.14% and the incidence density of VAP was 31.7/1000 ventilator days, another study indicates the VAP rate was 6.242/ 1000 ventilator days.³
- A study indicates Mortality in VAP patients is 61.84%. *Acinetobacter baumannii* (37.63%) and *Klebsiella pneumoniae* (36.55%) are the commonest organisms isolated followed by *Pseudomonas aeruginosa* and *Staphylococcus aureus*.³
- A systematic review indicates Ventilator-associated pneumonia incidence rate. Ranged from 2.13 per thousand ventilator days to 116 per thousand ventilator days differing greatly between countries. The highest VAP prevalence rate was reported from the Medical Intensive Care Unit (MICU), India. The mortality rate ranged from 16.2% to 74.17%. The highest mortality rate was reported from a study in India.⁴
- Mortality Rate is 27% & 43% with antibiotics Resistant organisms, in VAP mortality rate is caused by *Pseudomonas* or *Acinetobacter* is a higher rate of 76%.
- Mortality is highest for infections caused by *A. baumannii* (83.33%) and *K. pneumoniae* (71.42%).⁵

Pathogens

Staphylococcus aureus (44%) are the most frequently isolated microbes. *Acinetobacter baumannii* (30%), *Pseudomonas aeruginosa* (12%), *Stenotrophomonas maltophilia* (7%), *Klebsiella pneumoniae* (6%), and *Serratia marcescens* (2%) were isolated from the transtracheal aspirates or bronchoalveolar lavage in patients with VAP.⁵ An Indian study report indicates the most common organisms isolated from an endotracheal aspirate of patients who developed VAP are *Pseudomonas aeruginosa*, Methicillin-resistant *Staphylococcus aureus* (MRSA), *Klebsiella pneumoniae*, and *Acinetobacter baumannii*.⁵ Most strains of *Pseudomonas* (55.56%) are resistant to

commonly used beta-lactam antibiotics known to be effective against *Pseudomonas*. All strains of *Staphylococcus aureus* are MRSA and most isolates of *K. pneumoniae* (85.71%) are extended-spectrum beta-lactamase-producing. About 50% of isolates of *Acinetobacter* are resistant to carbapenems.⁵

Pathogenesis

The main pathogenic factor in the development of VAP is biofilm formation within the tracheal tube (TT) and microaspiration of secretions.⁷ The normal protective upper airway reflexes and prevents effective coughing are affected by the tracheal tube. The colonization of aerobic gram-negative bacteria occurs in the oropharynx. The contaminated secretions of the oropharynx pool above the tracheal tube cuff and slowly gain access to the lower airway through a fold in the wall of the cuff. A bacterial biofilm, which is impervious to antibiotics, gradually forms on the inner surface of the tube and serves as a nidus for infection.⁷ This pathogen-rich biofilm is pushed into the distal airways by ventilator cycling and in the setting of immunosuppression associated with critical illness causes pneumonia. The long-term requirement of mechanical ventilation increases the risk of developing VAP. patients in a supine position increase the risk of microaspiration and enteral feeding via a nasogastric tube increases the risk of aspiration of gastric contents.⁷ It is the main responsibility to prevent VAP to reduce biofilm formation and microaspiration.

Types of Pneumonia

- Community-acquired pneumonia
- Hospital-acquired pneumonia
- Ventilator-associated pneumonia

Community-Acquired Pneumonia

Early-onset of pneumonia less than 98 hrs. of intubation or ICU admission causative pathogens is *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*. Antibiotics sensitive

Hospital-Acquired Pneumonia

Late-Onset Pneumonia more than 98 hrs. of ICU admission or intubation, common causative pathogens *Pseudomonas aeruginosa*, methylene resistant *Staphylococcus aureus* (MRSA), *Acinetobacter*, *Enterobacter*, antibiotics resistant.

Ventilator Associate pneumonia: one type of hospital Acquired pneumonia that occurs more than 48 to 72 hrs. after endotracheal intubation.

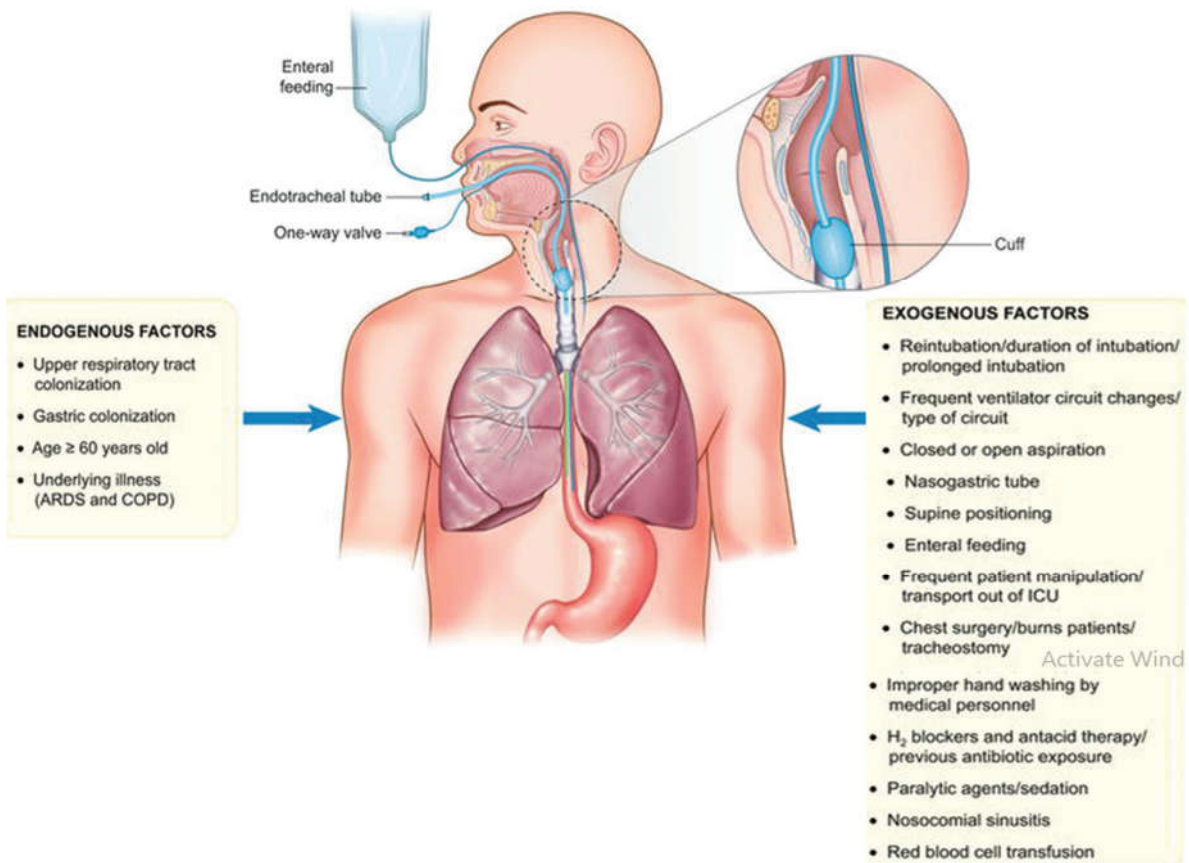
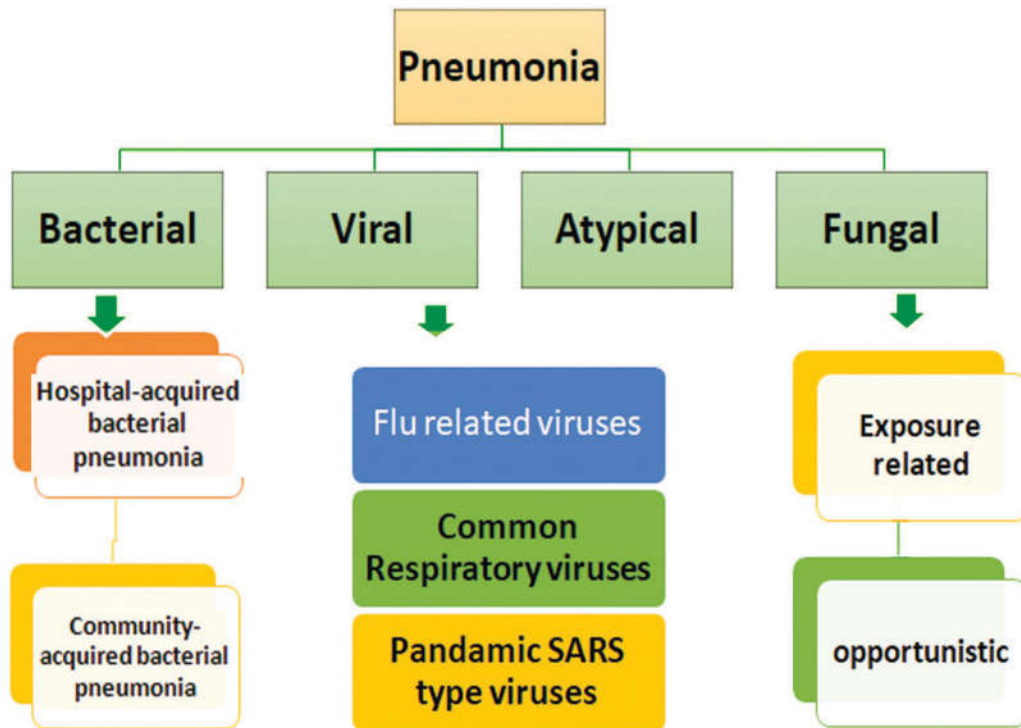


Figure presenting Aspiration of organisms from the oropharynx and GI tract, Direct inoculation, Inhaled Bacteria, and Hematogenous spread.

Risk Factors

Environmental factors

- Indoor air pollution is caused by cooking and heating with biomass fuels (such as wood or drug).
- Living in crowded homes.
- Prenatal smoking.

Secondary Disease

- Stroke
- Multiple sclerosis.
- Amyotrophic lateral sclerosis
- Head injury
- Senile dementia, Alzheimer's disease
- Poor immune systems
- AIDS
- History of organ transplant
- Cancer (especially leukemia and Hodgkin lymphoma)
- Chronic obstructive pulmonary disease (COPD)
- Diabetes
- Kidney disease
- Sleep apnea
- Heart failure
- Poor nutrition
- Allergies, asthma
- Liver disease
- Mechanical ventilation

Drugs

- Chemotherapy drugs
- Immune suppressant drugs steroids

Genetic disorders (sickle cell disease, cystic fibrosis)

- Cystic fibrosis
- Immobilization
- Tracheostomy

Infection

- Colonization: (colonization of dental plaque with respiratory pathogens).

- Bacterial colonization of the oropharyngeal area.
- Aspiration subglottic secretions
- Contaminated equipment's
- Contaminated hands (cross-contamination of hands)
- Supine position

Common Symptoms

- Difficulty in breathing
- Tachy cardia
- Fever
- Sweating
- Shivering
- Loss of appetite
- Pain in chest
- Hemoptysis
- Headache
- Fatigue
- Nausea
- Vomiting
- Complications:
- Septicemia
- Lung abscess
- Acute respiratory distress syndrome (ARDS)
- Middle ear infection
- Blood infection
- Meningitis
- Sepsis
- Peri carditis
- Atelectasis
- Pleural effusion
- Hypotension
- Tachypnea
- Confusion
- Septic shock
- Decreases in breath sounds
- Unequal chest expansion

Nursing Assessment and Care

- Conduct a Physical examination of the patient.
- Clinical pulmonary infection score (CIPS) to be recorded.
- Check vitals signs (Temperature, Pulse, Respiration, Blood pressure, and oxygen saturation).

- Send blood investigation (CBC, (WBC count), Blood culture, Biochemistry test)
 - Do Chest X-ray.
 - ABG/pulse oximetry
 - Serological studies, viral or legionella titers, cold agglutinins
 - Assist the intensivist in the assessment of Progression of infiltrate.
 - Send aspiration fluid (sputum) for gram stain /Culture
 - Microbial investigation -
 - Endotracheal aspiration (blind method suction of ET secretion)
 - Bal (Broncho alveolar lavage)
 - Percutaneous aspiration/open biopsy of lung tissues.
 - Mini Bal (blind method catheter is advanced till resistance is met.
 - Protected specimen brush (minimizes contamination during Bronchoscopy because the brush is contained in a protective sheath.
 - Fiber optic Bronchoscopy or transcutaneous needle aspiration /biopsy.
 - Prognosis: with treatment most, types of bacterial pneumonia will stabilize in 3-6 days.it often takes a few weeks before most symptoms are resolved .in person require hospitalization, mortality may be as high as 10%and in those requiring intensive care it may reach 30-50%.
- Positioning changing every 4th hourly
 - Maintain head end elevation 35 to 45 degrees
 - Promote procedures and protocols that safely avoid or reduce the time on the ventilator
 - Suctioning properly (subglottic, or endotracheal).
 - Maintain aseptic technique while caring for the patient.
 - Sedation vacation as advised by the intensivist
 - Need for antacid assessment to the patient
 - Use different sizes catheters for oral and nasal suctioning.
 - Assess the ventilator circuit days and change
 - Chest physiotherapy loosens and mobilizes secretions.
 - Administering antibiotics as per physician's order.
 - Maintain VAP (ventilator-associated pneumonia) bundle as per infection control policy.
 - Provide adequate oxygen support to the patient.
 - Maintain adequate airway clearance
 - Maintain adequate hydration
 - Provide health education regarding vaccination, aseptic techniques.

Nursing Management of a patient with pneumonia

- Take a careful physical examination of patients to help to get an etiological diagnosis.
- Assess the elderly patient's unusual behavior, alter mental status, dehydration excessive fatigue, and concomitant heart failure.
- Observe for anxious, flushed appearance shallow respirations splinting of affected sides, confusion, dehydration
- Auscultate for crackles overlying affected sites and for bronchial breath sounds when consolidation is present
- Education and training in the appropriate airway management
- Strict hand hygiene for airway management
- 2nd hourly ET cuff pressure monitoring
- Apply moisal eye drops 2nd hourly
- Oral hygiene (chlorohexidine mouth wash 2nd hourly

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