Supplementary material 1: Outcome definition

VAP surveillance in Brazil - ANVISA criteria(9)

1. Patient on mechanical ventilator (MV) for a period longer than two consecutive days (i.e., starting from day 3, where day 1 is the day of MV installation) and who, on the date of infection, was either using MV or had it removed the day before.

AND

2. Without underlying heart or lung disease, with ONE or more serial imaging exams showing any of the following findings, whether new, persistent, or progressive:
    - Infiltration
    - Opacification/consolidation
    - Cavitation
    - Pneumatocele

AND

3. At least ONE of the following signs or symptoms:
    - Fever (temperature: >38ºC) without any other associated cause.
    - Leukopenia (<4000 cells/mm3) or leukocytosis (>12000 cells/mm3 or ≥15000 cells/mm³ with left shift and more than 10% of immature neutrophils in children ≤14 years old).
    - Change in level of consciousness without any other apparent cause in patients ≥70 years old.

AND

4. At least TWO of the following signs or symptoms:
    - Onset of purulent secretion or change in characteristics of the secretion or increase in respiratory secretion or increase in the need for suctioning.
    - Apnea, tachypnea, dyspnea, or cough (new episode or worsening).
    - Auscultation with wheezing, snoring, or crackles (new episode or worsening).
    - Worsening of gas exchange, desaturation, increased oxygen demand or increased respiratory rate or changes in ventilatory parameters for at least 2 days.

AND

- The signs/symptoms and imaging findings occurred during the window period of infection.

OR

5. ONE of the criteria above (Item 4) AND at least ONE of the following results:
    - Positive blood culture4 without another focus of infection.
    - Positive culture of pleural fluid.
    - Quantitative culture positive for pulmonary secretion obtained by a procedure with minimal potential for contamination (bronchoalveolar lavage, protected brush and endotracheal aspirate5).
    - In bacterioscopy of bronchoalveolar lavage, finding of ≥ 5% of leukocytes and macrophages containing microorganisms (presence of intracellular bacteria).
    - Positive culture of lung tissue.
    - Histopathological examination showing at least one of the following evidences of pneumonia:
        - Formation of abscess or consolidation focus with polymorphonuclear infiltration in bronchioles and alveoli;
        - Evidence of invasion of lung parenchyma by hyphae or pseudo-hyphae.
    - Virus, Bordetella, Legionella, Chlamydophila, or Mycoplasma identified from secretion or lung tissue culture, or identified by microbiological testing performed for clinical diagnosis or treatment purposes.
    - 4-fold increase in IgG values in serology for pathogen (example: Chlamydophila).
    - 4-fold increase in IgG values in serology for Legionella pneumophila serogroup I titrated ≥ 1:128 in acute and convalescent phases by indirect immunofluorescence.
    - Detection of antigen of Legionella pneumophila serogroup I in urine.

AND

6. The signs/symptoms and imaging/laboratory tests occurred during the window period of infection.

VAE surveillance in USA – NHSN criteria(12)

VAEs are identified by using a combination of objective criteria: deterioration in respiratory status after a period of stability or improvement on the ventilator, evidence of infection or inflammation, and laboratory evidence of respiratory infection. There are three definition tiers within the VAE algorithm: 1) Ventilator-Associated Condition (VAC); 2) Infectionrelated Ventilator-Associated Complication (IVAC); and 3) Possible VAP (PVAP).

1. Ventilator-Associated Condition (VAC):

Patient has a baseline period of stability or improvement on the ventilator, defined by ≥ 2 calendar days of stable or decreasing daily minimum* FiO2 or PEEP values. The baseline period is defined as the 2 calendar days immediately preceding the first day of increased daily minimum PEEP or FiO2.

* Daily minimum defined by lowest value of FiO2 or PEEP during a calendar day that is maintained for > 1 hour

AND

After a period of stability or improvement on the ventilator, the patient has at least one of the following indicators of worsening oxygenation:

- Increase in daily minimum FiO2 of ≥ 0.20 (20 points) over the daily minimum FiO2 of the first day in the baseline period, sustained for ≥ 2 calendar days.
- Increase in daily minimum PEEP values of ≥ 3 cmH2O over the daily minimum PEEP of the first day in the baseline period†, sustained for ≥ 2 calendar days.

2. Infection-related Ventilator-Associated Complication (IVAC):

Patient meets criteria for VAC AND on or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, the patient meets both of the following criteria:

- Temperature > 38 °C or < 36°C, OR white blood cell count ≥ 12,000 cells/mm3 or ≤ 4,000 cells/mm3.

  AND

- A new antimicrobial agent is started and is continued for ≥ 4 qualifying antimicrobial days (QAD).

Possible Ventilator-Associated Pneumonia (PVAP)

Patients meet criteria for IVAC AND On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, ONE of the following criteria is met:

Criterion 1: Positive culture of one of the following specimens, meeting quantitative or semi-quantitative thresholds without requirement for purulent respiratory secretions:

- Endotracheal aspirate, ≥ 105 CFU/ml or corresponding semi-quantitative result
- Bronchoalveolar lavage, ≥ 104 CFU/ml or corresponding semi-quantitative result
- Lung tissue, ≥ 104 CFU/g or corresponding semi-quantitative result
- Protected specimen brush, ≥ 103 CFU/ml or corresponding semi-quantitative result

Criterion 2: Purulent respiratory secretions (defined as secretions from the lungs, bronchi, or trachea that contain ≥ 25 neutrophils and ≤ 10 squamous epithelial cells per low power field [lpf, x100]) PLUS organism identified from one of the following specimens (to include qualitative culture, or quantitative/semi-quantitative culture without sufficient growth to meet Criterion #1):

- Sputum
- Endotracheal aspirate
- Bronchoalveolar lavage
- Lung tissue
- Protected specimen brush

Criterion 3: One of the following positive tests:

- Organism identified from pleural fluid (where specimen was obtained during thoracentesis or within 24 hours of chest tube placement; pleural fluid specimens collected after a chest tube is repositioned or from a chest tube in place > 24 hours are not eligible for PVAP)
- Lung histopathology, defined as: 1) abscess formation or foci of consolidation with intense neutrophil accumulation in bronchioles and alveoli; 2) evidence of lung parenchyma invasion by fungi (hyphae, pseudohyphae, or yeast forms); 3) evidence of infection with the viral pathogens listed below based on results of immunohistochemical assays, cytology, or microscopy performed on lung tissue
- Diagnostic test for Legionella species
- Diagnostic test on respiratory secretions for influenza virus, respiratory syncytial virus, adenovirus, parainfluenza virus, rhinovirus, human metapneumovirus, coronavirus.