Hospital-Acquired and Ventilator-Associated Pneumonia: Evaluation and Treatment Guidelines (in Acute)

Site Applicability

All VCH Acute sites

Practice Level

Physicians – basic skill

Pharmacists - basic skill.

Need to Know

Canadian and US guidelines have been published that provide a framework for the evaluation and treatment of hospital-acquired pneumonia (HAP) and ventilator associated pneumonia (VAP). [1,2] This will support efforts that focus on reducing unnecessary broad coverage and unnecessary long duration of treatment for HAP and VAP. Such reduced antibiotic exposure would be expected to help reduce the emergence of antimicrobial resistance, reduce the potential for adverse effects and reduce drug costs.

Background

A significant opportunity for improvement exists

A small observational study was conducted at VGH ICU to identify whether, if the CPIS is used, there is opportunity to improve cessation of antibiotic therapy for presumed VAP. Between October 3rd 2005 and March 31st 2006, 17/49 (35%) patients treated for presumed VAP could have had antibiotics stopped at day#3 because the CPIS was 6 or less at both day#1 and day#3. Less then 15% of these patients actually had antibiotics stopped at day#3. Antibiotics could have been discontinued at day#7 for 10/31 (32%) patients because of a CPIS score of 6 or less at both day#1 and day#7. Less than 10% of these patients actually had antibiotics discontinued at day#7. The mean duration of treatment was 15 days $\pm$ 11 days[3]

Guideline

Recommendations

These recommendations are not intended to replace clinical judgment but rather to provide an organizational framework for managing immunocompetent adult patients with bacterial causes of HAP and VAP.

1. A chest radiograph should be performed if the patient has two or more of the following clinical features and no alternative infective focus:
   - Temperature greater than 38°C or less than 36°C
   - Leucopenia or leukocytosis
   - Purulent tracheal secretions
   - Decreased PaO_2

2. The clinical diagnosis defines pneumonia as a new or progressive lung infiltrate plus at least two of the three clinical features (fever more than 38°C or less than 36°C, leucopenia or leukocytosis and purulent secretions).[2]

- A sputum specimen should be sent for Gram Stain and culture in any patient with a suspected pneumonia, before antibiotics are started, provided that this does not delay therapy.
- Appropriate antibiotics should be started promptly and at appropriate doses considering clinical presentation, local epidemiology and risk factors for multi-drug resistant pathogens.

3. The Clinical Pulmonary Infection Score can be calculated daily for all patients with suspected pneumonia. The CPIS score can be used to identify patients who could have a short 3 day course of antibiotics:
   - Patients who have a CPIS score of 6 or less at initiation of antibiotics through to day 3 can have antibiotics stopped on day#3.

4. In patients who have a CPIS score of more than 6 at initiation, therapy should be re-evaluated based on clinical response and microbiological culture results:
   - Therapy should be streamlined to the offending pathogen to ensure appropriate coverage without unnecessary broad coverage.

5. A short course of 7-8 days of initially appropriate therapy should suffice for most cases of HAP and VAP with the following caveats:
   - This is provided that the patient has had a good clinical response with resolution of clinical features of infection as indicated by a declining CPIS score.
   - If HAP is caused by *Pseudomonas aeruginosa* or other multi-drug resistant non-lactose fermenting organism e.g. Acinetobacter or Enterobacter species longer treatment durations may be needed. If therapy is stopped at day 7-8, the physician should be vigilant for signs of relapse.
   - If the patient has severe VAP caused by MRSA or *Pseudomonas aeruginosa* or other multi-drug resistant non-lactose fermenting organism, longer treatment durations may be needed. Severe VAP is defined as pneumonia presenting with either hypotension, sepsis syndrome, rapidly progressing infiltrates, end organ dysfunction.

6. A switch to enteral therapy can be made in selected patients with a good clinical response and a functioning intestinal tract. 2

Expected client outcome

Patients will be less likely to experience a super-infection or other adverse drug event such as Clostridium difficile infection as a result of unnecessarily broad and unnecessarily long duration of antibiotics. Future patients admitted to our sites will be less at risk of acquiring infections caused by mult-resistant pathogens.

Documentation

- When a CPIS score has been calculated, it should be documented in the progress notes.
- If antibiotics are to be continued beyond 8 days, rationale should be documented.

References

1. Rotstein C, Evans G, Born A, Grossman R, Light B, Magder S et al. Clinical Practice Guidelines for hospital-acquired pneumonia and ventilator-associated pneumonia in adults. *Can J Infect Dis Med Microbiol 2008;19:19-53.*

2. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med 2005;171:388-416.*

3. Stewart M, Gorman SK, Slavik RS, de Lemos J, Chittock D, Dhingra V, Ronco JJ, Parwana H. Identifying opportunities to curtail antimicrobial therapy for presumed VAP using the clinical pulmonary infection score. *Can J Hosp Pharm 2009;62:217-225*

4. Singh N, Rogers P, Atwood C, Wagener M, Yu V. Short-course empiric antibiotic therapy for patients with pulmonary infiltrates in the intensive care unit. Am J Respir Crit Care Med 2000;162:505-511.

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Appendices:

Appendix 1

APPENDIX

CLINICAL PULMONARY INFECTION SCORE CALCULATION*†

Temperature (°C)
- > or equal to 36.5 and < or equal to 38.4 = 0 point
- > or equal to 38.5 and < or equal to 38.9 = 1 point
- > or equal to 39 and < or equal to 36 = 2 points

Blood leukocytes, mm^3
- > or equal to 4,000 and < or equal to 11,000 = 0 point
- < 4,000 or > 11,000 = 1 point + band forms > equal to 50% = add 1 point

Tracheal secretions
- Absence of tracheal secretions = 0 point
- Presence of nonpurulent tracheal secretions = 1 point
- Presence of purulent tracheal secretions = 2 points

Oxygenation: Pa_{O_2}/Fi_{O_2}, mm Hg
- > 240 or ARDS (ARDS defined as Pa_{O_2}/Fi_{O_2}, or equal to 200, pulmonary arterial wedge pressure
- < or equal to 18 mm Hg and acute bilateral infiltrates) = 0 point
- < or equal to 240 and no ARDS = 2 points

Pulmonary radiography
- No infiltrate = 0 point
- Diffuse (or patchy) infiltrate = 1 point
- Localized infiltrate = 2 points

Progression of pulmonary infiltrate
- No radiographic progression = 0 point
- Radiographic progression (after CHF and ARDS excluded) = 2 points

Culture of tracheal aspirate
- Pathogenic bacteria‡ cultured in rare or light quantity or no growth = 0 point
- Pathogenic bacteria cultured in moderate or heavy quantity = 1 point
- Same pathogenic bacteria seen on Gram stain, add 1 point

Definition of abbreviations: ARDS = acute respiratory distress syndrome; CHF = congestive heart failure; Pa_{O_2}/Fi_{O_2} = ratio of arterial oxygen pressure to fraction of inspired oxygen.

* Modified from Pugin and coworkers (8).

† CPIS at baseline was assessed on the basis of the first five variables, i.e., temperature, blood leukocyte count, tracheal secretions, oxygenation, and character of pulmonary infiltrate. CPIS at 72 h was calculated based on all seven variables and took into consideration the progression of the infiltrate and culture results of the tracheal aspirate. A score > 6 at baseline or at 72 h was considered suggestive of pneumonia.

‡ Predominant organism in the culture.

Assessment of oxygenation (PaO_2/FiO_2) when PaO_2 not measured

PaO_2/FiO_2 is less than 240 if SpO2 is 96% or less and the patient is receiving oxygen via either nasal prongs at 4L/min or more or via any mask device.

(The FiO2 of oxygen delivered by any mask device is 40% or more; FiO2 is approximately 36% when oxygen is delivered via nasal prongs at 4L or more; SpO_2 96% = PaO_2 81.5).

Source: Oxygen Therapy and Respiratory Care Reference Manual 2003; Vancouver Hospital