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# Resolution of Clinical Signs in Trauma Intensive Care Unit Patients Following Diagnosis of Ventilator-Associated Pneumonia

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**Abstract**
PURPOSE: The ATS/IDSA Ventilator-Associated Pneumonia (VAP) guidelines suggest that clinical improvement of VAP should be apparent within 3-6 days. Anecdotally, such improvement has not been noted in trauma patients at our institution. The current study was conducted to evaluate resolution of clinical signs of VAP following diagnosis.

METHODS: Critically injured adults admitted to the trauma intensive care unit (TICU) from 6/1/06-12/31/07 and subsequently diagnosed with VAP were retrospectively reviewed. Clinical signs, including derangements of maximum temperature (Tmax), white blood cell (WBC) count and Pa02/FiO2, were evaluated on days 1-16 following VAP diagnosis. Data are presented as mean ± SD unless otherwise stated. Clinical parameters following VAP were compared using repeated measures ANOVA with the Tukey test for multiple comparisons.

RESULTS: A total of 82 patients were identified. Data for the 34 patients without concurrent infections are presented. Demographic data include: Age 46 ± 17 years; 71% males; 94% blunt trauma; median (IQR) Injury Severity Score 29.5 (24 to 38); duration of mechanical ventilation 33 ± 27 days; ICU length of stay (LOS) 39 ± 25 days; hospital LOS 53 ± 33 days. Clinical signs following VAP diagnosis (Figure): Tmax (°F): Day 1=101.8 ± 1.3, Day 3=101.1 ± 1.1, Day 6=101.1 ± 1.4, Day 16=100.1 ± 3. Compared to Day 1, there was a significant reduction in Tmax at Days 10, 11, 12, 13, 14 and 16 ($p < 0.05$ for all). WBC count (cells/μL): Day 1=12.9 ± 5, Day 3=13.7 ± 5, Day 6=14.4 ± 5, Day 16=13.8 ± 6. There was no significant difference in WBC count on Days 1-16 ($p=0.42$). PaO2/FiO2: Day 1=232 ± 108, Day 3=200 ± 87, Day 6=218 ± 104, Day 16=246 ± 126. Differences in PaO2/FiO2 on Days 1-16 did not reach statistical significance ($p=0.06$).

CONCLUSIONS: In trauma patients, improvement of clinical parameters following diagnosis of VAP is delayed beyond the 3-6 day timeframe suggested in the ATS/IDSA guidelines. Alternative methods for determining resolution of VAP in trauma patients should be investigated. METHODS INTRODUCTION

**Disciplines**
Pharmacy and Pharmaceutical Sciences

**Comments**
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# Resolution of Clinical Signs in Trauma Intensive Care Unit Patients Following Diagnosis of Ventilator-Associated Pneumonia, ID #311

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## ABSTRACT

PURPOSE: The ATS/IDSA Ventilator-Associated Pneumonia (VAP) guidelines suggest that clinical improvement of VAP should be apparent within 3-6 days. Anecdotally, such improvement has not been noted in trauma patients at our institution. The current study was conducted to evaluate resolution of clinical signs of VAP following diagnosis.
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## INTRODUCTION

VAP is the most frequent ICU-acquired infection among mechanically ventilated patients, associated with increased morbidity, costs and ~30-70% mortality. The VAP Guidelines use clinical parameters to define normal pattern of resolution, i.e., WBC (normal: 5-10 cells/µL), temperature (normal: 98.6° F), $PaO_2$:$FiO_2$ (normal : 380 -475)[1]. These guidelines suggest clinical improvement is seen at ≥ 72 hours, and recommend a duration of therapy of 7-14 days. Denneson *et al* described resolution of VAP in a mixed ICU and noted trends of WBC, temperature and $PaO_2$:$FiO_2$ over time[2]. He found that response occurred in 6 days, which is different than the guidelines. However, trauma patients are different, as they have a 2-3x greater incidence of VAP than other populations[3], and 90% experience systemic inflammatory response syndrome (SIRS) in the 1st week[4].

## PURPOSE

We were interested in determining if Denneson's findings could be extrapolated to ventilated patients in other settings. Our purpose was to describe resolution of clinical signs of VAP in trauma patients. We hypothesized that trauma patients have delayed resolution of clinical signs of VAP.

## METHODS

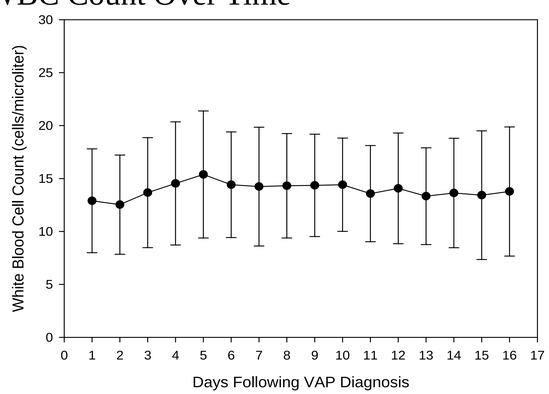
Design: Retrospective review from pre-existing database
Inclusion Criteria: Critically injured trauma patients diagnosed with VAP
Exclusion Criteria: Age <18 years, pregnant, immunocompromised, immunosuppressed
Clinical Endpoints: Improvement or resolution of temperature, WBC, $PaO_2$: $FiO_2$.
Statistical analysis: Descriptive Statistics, one-way repeated measures ANOVA for daily comparisons of clinical parameters

All patients diagnosed with fiberoptic bronchoscopy, treated with current TICU VAP Pathway

## RESULTS

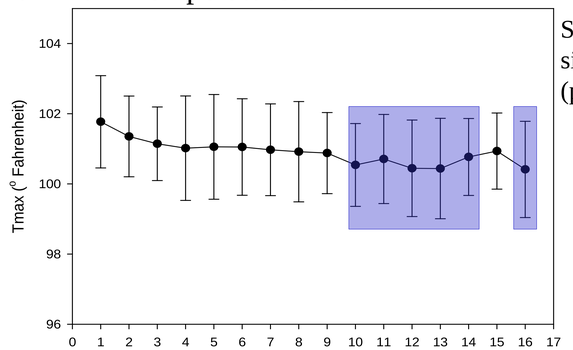
| | All Patients (n = 82) | Patients without Concurrent Infections (n = 34) | Patients with Concurrent Infections (n = 48) | P value |
|---|---|---|---|---|
| **Age** | 44 ± 17 | 46 ± 17 | 43 ± 17 | 0.39 |
| **Males/Females (% Male)** | 60/23 (72) | 24/10 (71) | 36/13 (73) | 0.97 |
| **MOI, (% Blunt)** | 86 | 32/2 (94) | 39/10 (80) | 0.11 |
| **Injury Severity Score, median (IQR)** | 34 (25 to 42) | 29.5 (24 to 38) | 34 (26 to 42) | 0.19 |
| **MV** | 32 ± 32 | 33 ± 27 | 32 ± 36 | 0.49 |
| **ICU LOS** | 37 ± 31 | 39 ± 25 | 36 ± 34 | 0.21 |
| **Hospital LOS** | 51 ± 38 | 53 ± 33 | 49 ± 42 | 0.11 |
| **Mortality, Dead/Alive (% Mortality)** | 16/67 (19) | 4/30 (12) | 12/37 (25) | 0.25 |

WBC Count Over Time

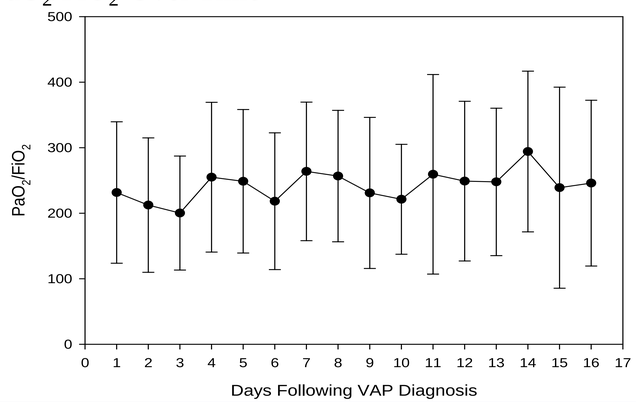



## RESULTS - CONTINUED

Maximum Temperature Over Time




$PaO_2/FiO_2$ Over Time




## CONCLUSIONS

Rapid resolution of signs of VAP is not seen in trauma patients as suggested by the VAP guidelines, and similar to the results of Denneson's study. Clinical parameter trends show a slow response to appropriate antimicrobial therapy . Future studies should explore other methods to determine clinical response to VAP in trauma patients, in order to avoid unnecessary antibiotic use and adverse effects and minimize costs.

**References:** 1. *Am J Respir Crit Care Med*, 2005; 388-416, 2. *A Am J Respir Crit Care Med.* 2001;163:1375. 3. *Am J Infect Cont.* 2008; 36(9):609-626. 4. *J Trauma. 2006;61:310 -317.*