

## Trauma Antimicrobial Stewardship Practice Management Guideline

**Purpose:** To guide appropriate antimicrobial use and decrease microbial resistance on the trauma service

**Background:** Appropriate empiric therapy is critical for decreasing mortality associated with severe infections. Empiric regimens should be chosen based on local antibiograms, common bacteria associated with the suspected infection, and patient specific factors. Rotation of antimicrobials is not currently recommended by the IDSA as a strategy to reduce antibiotic resistance, as data do not support its use. Guidelines for empiric antimicrobial utilization and dosing and appropriate de-escalation strategies such as MRSA nasal PCR screening allow for hospitals to optimize treatments of infections.

### Components:

- **Prophylactic Antibiotics** (*see respective PMGs*)
  - Duration: ≤ 24h
  - Narrow spectrum antibiotics
    - Perioperative abdominal trauma
    - Open orthopedic fractures
    - Craniofacial trauma
- **Evidence-based diagnosis of infections**
  - VAP: quantitative BAL ( $\geq 10^4$  CFU/mL)
  - Targeted empiric therapy (when known source)
- **Empiric Antibiotic Protocols**
  - Directed by unit-specific antibiograms
  - Indication-specific empiric therapy
    - Pneumonia (CAP/HAP/VAP)
    - UTI (*see respective PMG*)
    - Intra-abdominal
    - Bacteremia, CNS, or unknown source
  - De-escalation strategies
    - MRSA Nasal PCR Screening
  - Evidence-based antibiotic duration

### Indication-Specific Preferred Empiric Antibiotics:

	CAP*	VAP <sup>^</sup> or HAP <sup>#</sup>	Intra-abdominal Infection**	Bacteremia
Empiric Antibiotic	Ceftriaxone + Azithromycin	Vancomycin + Cefepime	Piperacillin/tazobactam ± Vancomycin ± Fluconazole	Vancomycin + Cefepime
PCN Allergy	Levofloxacin	Vancomycin + Levofloxacin	Levofloxacin + Metronidazole ± Vancomycin ± Fluconazole	Vancomycin + Levofloxacin

\*Community- acquired pneumonia (CAP): pneumonia acquired outside of the hospital setting

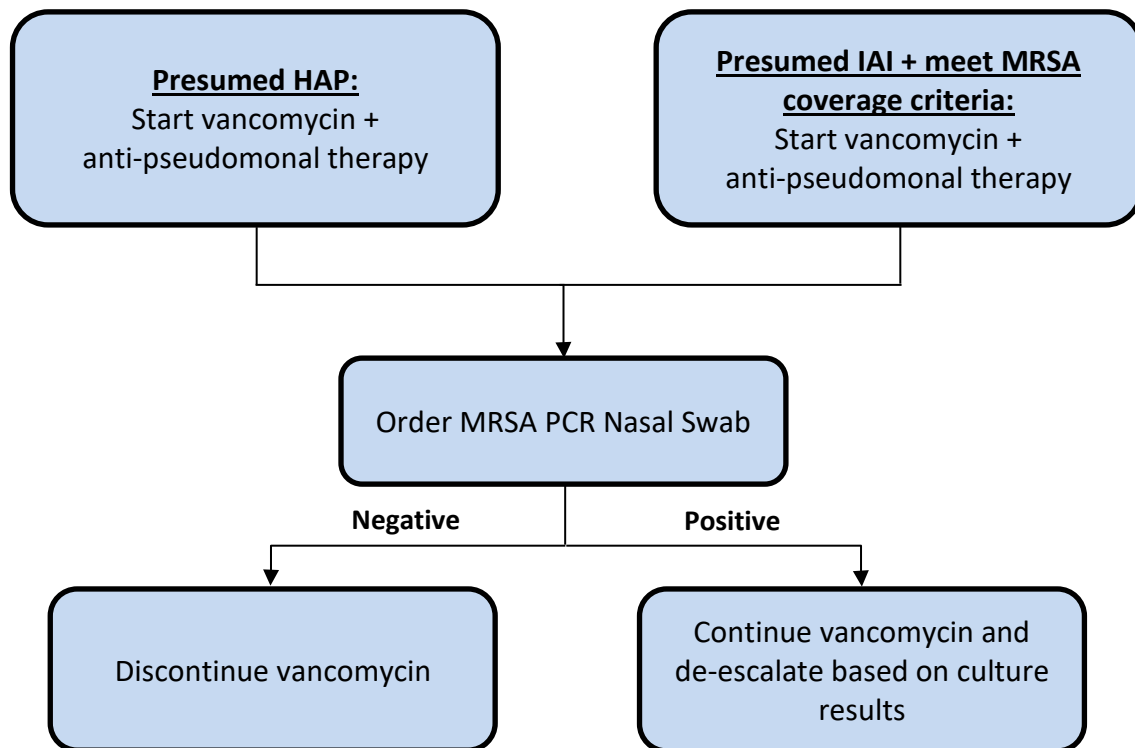
<sup>^</sup>Ventilator-acquired pneumonia (VAP): pneumonia occurring greater than 48 hours after endotracheal intubation

<sup>#</sup>Hospital-acquired pneumonia (HAP): pneumonia not incubating at the time of hospital admission and occurring  $\geq 48$ h after admission and includes ventilator-associated pneumonia

**\*\*Intra-abdominal Infection Considerations:**

- **Consider adding fluconazole:**
  - Upper gastrointestinal perforations **AND** critically ill (e.g., septic shock)
  - Recurrent bowel perforations
  - Surgically treated pancreatitis
  - Candida growth on cultures
  - Known colonization with candida
  - Immunocompromised patients
- **Consider addition of vancomycin:**
  - Prior MRSA infection
  - Recent hospitalization and/or nursing facility exposure
  - Intravenous antibiotic use within the past 90 days

**De-escalation Strategies:**



• **Considerations:**

- Not for patients with VAP
- Repeat MRSA PCR nasal swab if 7 days have elapsed since prior swab and starting antibiotics for a new infection (HAP and IAI only).
- Can consider re-initiating vancomycin in patients with a negative MRSA PCR nasal swab if patient is decompensating.

**Duration of Therapy:**

- CAP: 5-7 days
  - Can discontinue antibiotics as early as day 5 of therapy if clinically stable
- HAP/VAP: 7 days
- Intra-abdominal infection
  - Source-control: 4 days after source control
  - No source-control: 7 days then trial stopping antibiotics if clinically stable.
- Bacteremia
  - Gram negative
    - Uncomplicated: 7 days
    - Complicated (hemodynamic instability, persistently febrile, uncontrolled focus of infection, endocarditis, recurrent bacteremia, polymicrobial growth, or immunosuppression): 14 days
  - Gram positive
    - ID consult required for *S. aureus* or *Enterococcus* bacteremia
    - Duration: 2-6 weeks depending on presence/absence of endocarditis, repeat cultures (obtained 2-4 days after initial set), defervescence within 72h of antimicrobial therapy, and evidence of metastatic sites of infection
- Empyema
  - 2-6 weeks
  - Recommend ID consult due to prolonged antibiotics requiring outpatient follow-up

## References

1. Barlam TF, Cosgrove SE, Abbo LM, et al. Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. *Clin Infect Dis* 2016; 62(10):e51-77.
2. van Duijn P, Verbrugghe W, Jorens PG, et al. The effects of antibiotic cycling and mixing on antibiotic resistance in intensive care units: a cluster-randomised crossover trial. *Lancet Infect Dis*. 2018 Apr;18(4):401-409.
3. Kalili A, Metersky M, Klompas M, et al. Management of adults with hospital-acquired and ventilator-associated pneumonia: 2016 clinical practice guidelines by the Infectious Diseases Society of America and the American Thoracic Society. *Clin Infect Dis*. 2016;63(5):e61-e111.
4. Mazuski JE, Tessier JM, May AK, et al. The Surgical Infection Society Revised Guidelines on the Management of Intra- Abdominal Infection. *Surg Infect (Larchmt)*. 2017;18(1):1-76.
5. Hammond DA , Smith MN , Li C , Hayes SM , Lusardi K , Bookstaver PB . Systematic review and meta-analysis of acute kidney injury associated with concomitant vancomycin and piperacillin/tazobactam. *Clin Infect Dis* 2017; 64:666–74.
6. Riccio LM, Popovsky KA, Hranjec T et al. Association of Excessive Duration of Antibiotic Therapy for Intra-Abdominal Infection with Subsequent Extra-Abdominal Infection and Death. *Surg Infect (Larchmt)* 2014; 15(4):417-424.
7. Chastre J, Wolff M, Fagon J et al. Comparison of 8 vs 15 days of antibiotic therapy for ventilator-associated pneumonia in adults. *JAMA* 2003; 290 (19): 2588-98.
8. Sawyer RG, Claridge JA, Nathens AB, et al. Trial of Short-Course Antimicrobial Therapy for Intraabdominal Infection. *N Engl J Med* 2015;372:1996-2005.
9. Montravers P, tubach F, Lescot T, et al. Short-course antibiotic therapy for critically ill patients treated for postoperative intra-abdominal infection: the DURAPOP randomised clinical trial. *Intensive Care Med*. 2018 Mar;44(3):300-310.
10. Champion M, Scuuly G. *Journal of Intensive Care Medicine* 2018, Vol. 33(12) 647-655
11. Metlay JP, Waterer GW, et al. Diagnosis and Treatment of Adults with Community-acquired Pneumonia. An official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. *Am J Respir Crit Care Med*. 2019 Oct 1;200(7):e45-e67.
12. Raush N, Betthausen KD, Shen K, et al. Prospective Nasal Screening for Methicillin-Resistant *Staphylococcus aureus* (MRSA) in Critically Ill Patients with Suspected Pneumonia. *Open Forum Infect Dis*. 2021;9(1):ofab578. doi: 10.1093/ofid/ofab578.
13. Parente DM, Cunha CB, Mylonakis E, et al. The Clinical Utility of Methicillin-Resistant *Staphylococcus aureus* (MRSA) Nasal Screening to Rule Out MRSA Pneumonia: A Diagnostic Meta-analysis With Antimicrobial Stewardship Implications. *Clin Infect Dis*. 2018;67(1):1-7.
14. Turner SC, Seligson ND, Parag B, et al. Evaluation of the timing of MRSA PCR nasal screening: How long can a negative assay be used to rule out MRSA-positive respiratory cultures? *Am J Health Syst Pharm*. 2021;78(Supplement\_2):S57-S61.
15. Liu C, Bayer A, Cosgrove SE, et al. Infectious Diseases Society of America. Clinical practice guidelines by the infectious diseases society of America for the treatment of methicillin-resistant *Staphylococcus aureus* infections in adults and children. *Clin Infect Dis*. 2011;52(3):e18-55.
16. von Dach E, Albrich WC, Brunel A, et al. Effect of C-Reactive Protein–Guided Antibiotic Treatment Duration, 7-Day Treatment, or 14-Day Treatment on 30-Day Clinical Failure Rate in Patients With Uncomplicated Gram-Negative Bacteremia A Randomized Clinical Trial. *JAMA*. 2020;323(21):2160-2169.

**DIVISION OF ACUTE CARE SURGERY**

17. Yahav D, Franceschini E, Koppel F, et al. Bacteremia Duration Study Group. Seven Versus 14 Days of Antibiotic Therapy for Uncomplicated Gram-negative Bacteremia: A Noninferiority Randomized Controlled Trial. *Clin Infect Dis*. 2019;69(7):1091-1098.
18. Mergenhagen KA, Starr KE, Eattengel BA, et al. Determining the utility of methicillin-resistant staphylococcus aureus nare screening in antimicrobial stewardship. *Clin Infect Dis*. 2020;71(5):1142-1148.
19. Shen KR, Bribriescio A, Crabtree T, et al. The American Association for Thoracic Surgery consensus guidelines for the management of empyema. *JTCVS*. 153(6):e129-e146.
20. Solomkin JS, Mazuski JE, Bradley JS, et al. Diagnosis and Management of Complicated Intra-abdominal Infection in Adults and Children: Guidelines by the Surgical Infection Society and the Infectious Diseases Society of America. *Clin Infect Dis*. 2010;50(2):133-164.
21. Lee W, Liew Y, Chlebicki MP, et al. An Observational Study on Early Empiric versus Culture-Directed Antifungal Therapy in Critically Ill with Intra-Abdominal Sepsis. *Crit Care Res Prac*.2014;2014:479413.
22. Peterson MW, Perner A, Ravn F, et al. Untargeted antifungal therapy in adult patients with complicated intra-abdominal infection: a systematic review. *Acta Anaesthesiol Scand*. 2018;62(1):6-18.

**Revised**

May, 2020, May 2022

**Authors:**

Brad Dennis, MD

Jill Streams, MD

Leanne Atchison, PharmD

Jennifer Beavers, PharmD, BCPS

Jeremy Jenkins, PharmD