Medication use evaluation of tigecycline at a public teaching safety net hospital

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Background

- Nassau University Medical Center (NUMC) is a 530-bed tertiary-care community teaching hospital. As a level-one trauma center and Nassau County's safety net hospital, NUMC serves all populations of the County including the most critically injured and Medicaid and uninsured patients.
- Tigecycline is a broad spectrum antibiotic with activity against extended-spectrum beta-lactamases (ESBLs), Acinetobacter species, methicillin-resistant Staphylococcus aureus (MRSA), and vancomycin-resistant Enterococcus (VRE).
- Tigecycline has FDA indications for the treatment of complicated skin and soft tissue infections, complicated intra-abdominal infections, and community-acquired bacterial pneumonia.[1]
- Tigecycline is a last line antibiotic due to the Food and Drug Administration (FDA) safety warnings for increased all-cause mortality.
- A meta-analysis of Phase 3 and 4 studies showed a higher risk of death among patients receiving tigecycline compared to other antibacterial drugs. This increased risk was greatest in patients treated with tigecycline for ventilator-associated pneumonia, a use for which FDA has not approved the drug.[2]
- Tigecycline is a tier 1 restricted antibiotic requiring infectious disease approval at all times at NUMC. In response to a request to loosen tigecycline restrictions to allow for intensive care unit (ICU), emergency department (ED), and overnight use without ID approval, the antimicrobial stewardship team (AST) conducted a medication use evaluation (MUE) to identify how tigecycline is prescribed at the institution.

Objectives

- To evaluate the use of tigecycline at NUMC and identify areas for improvement in regards to antimicrobial stewardship.

Methodology

- St. John's University and NUMC institutional review boards have approved this study.
- Single center, retrospective chart review on patients 18 years of age and older who received tigecycline for at least 24 hours from January 2018 to December 2018 at NUMC.
- Patients were identified from antibiotic usage data monitored by the AST.
- Additional patient information was collected from the patient's' electronic medical records.
- Quantitative analysis was used to describe data collected.

Results

Table 1: Baseline Demographics	
Age (years, median (range)	62 (25-84)
Height (cm), median (range)	165 (137-177.8)
Weight (kg), median (range)	88.4 (46.3-122.9)
CrCl (ml/min), median (range)	29.4 (10.3-175)
ICU admissions, no. of patients	11
Length of stay (days), median (range)	19 (3-168)
Comorbid conditions (no. of patients)	
Hypertension	18/23 (78.3%)
Diabetes	11/23 (47.8%)
Dyslipidemia	10/23 (43.5%)
COPD	6/23 (26%)
CHF	5/23 (21.7%)
CKD	4/23 (17.4%)

Table 2: Tigecycline Utilization	
Number of episodes	25
Number of patients	23
Duration of tigecycline (Days, median (range)	5 (1-17)
Tigecycline monotherapy (no. of patients)	3/25 (12%)

Table 3: Organisms Identified	
MDR *Acinetobacter baumannii*	8/34 (23.5%)
Carbapenemase producing *Klebsiella pneumoniae*	8/34 (23.5%)
VRE	5/34 (14.7%)
ESBL *E.coli*	4/34 (11.8%)
Proteus mirabilis	3/34 (8.8%)
Pseudomonas	2/34 (5.8%)
Stenotrophomonas maltophilia	2/34 (5.8%)
MRSA	2/34 (5.8%)

Table 4: Mortality	
All-cause 30-day mortality	14/25 (56.5%)

Figure 1: Antibiotic Allergies (no. of patients)

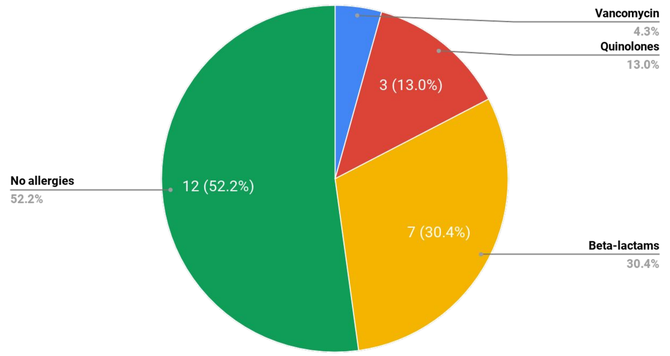


Figure 2: Tigecycline Doses Administered (n=25)

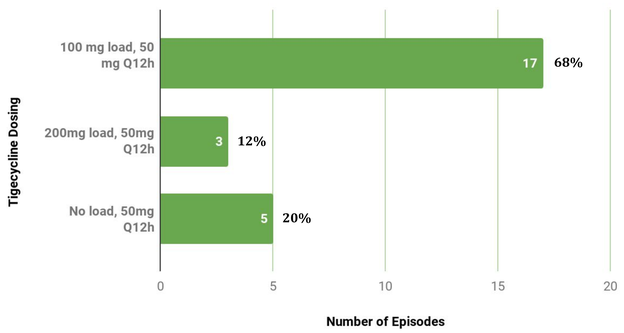
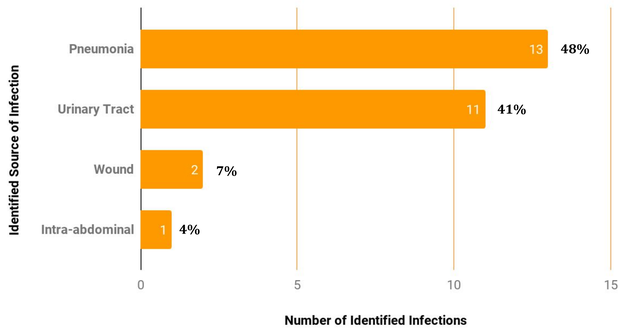


Figure 3: Sources of Infection (n=27)



Discussion

- Similar to published literature, tigecycline use at NUMC was associated with high all-cause mortality rates (56.7%).
- Only 12% of patients were on tigecycline monotherapy. This may demonstrate that patients treated with tigecycline at NUMC had severe, complicated infections since the majority of patients were on concomitant antibiotics.
- A portion of patients did not receive a loading dose of tigecycline while others received a higher loading dose of 200 mg (20% and 12%, respectively). This highlights inconsistent dosing of tigecycline at NUMC.

Conclusion

- Tigecycline use at NUMC was associated with high mortality rates in patients with severe and complicated infections.
- Based on the results of this MUE, NUMC's AST will:
  - Continue the same tier 1 restrictions for tigecycline
  - Develop criteria for use for tigecycline including standardization of dosing
  - Develop guidelines for the management of patients with infections caused by multidrug-resistant organisms (MDROs)
  - Prospective review all patients with infections caused MDROs
  - Evaluate and develop criteria for use for newer antibiotics in the treatment of MDROs
- A limitation of this study is that this MUE took place in one facility. The results may not be applicable to other institutions.
- AST is in the process of implementing Theradoc, a clinical surveillance program, which will help elevate antimicrobial stewardship initiatives and efforts.

References

1. Tigecycline [package insert]. Monza, Italy: Wyeth Pharmaceuticals; 2010.
2. Paul McGovern, et al. All-cause mortality imbalance in the tigecycline phase 3 and 4 clinical trials. International Journal of Antimicrobial Agents, Volume 41, Issue 5, May 2013, Pages 904–910.

Contact/Disclosures

- All authors have nothing to disclose.
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