Poster 103

Empiric antibiotic susceptibility using a traditional vs. syndromic antibiogram- Implications for antimicrobial stewardship programs

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Background

- A primary tenet of antimicrobial stewardship programs (ASPs) is to optimize antibiotic treatment recommendations.
- While traditional antibiograms are useful, intrinsic variability in susceptibility exists when stratifying by source and/or location.
- A syndromic antibiogram displays the likelihood of adequate coverage for a specific infection syndrome, considering the weighted incidence of pathogens causing that syndrome.
- Generating pathogen susceptibility data stratified by infection syndrome may provide clinicians a streamlined approach to empiric therapy selection for a specific infectious process such as Gram-negative pneumonia.
- The aim of this study was to compare antibiotic susceptibilities using a traditional versus syndromic antibiogram stratified by hospital location for common pathogens associated with pneumonia.

Methods

- Between 2016-2019, 20 US institutions per year submitted up to 250 consecutive targeted Gram-negative pathogens from hospitalized patients as part of the Study for Monitoring Antimicrobial Resistance (SMART).
- MICs were determined by broth microdilution and interpreted using 2020 CLSI breakpoints, except for imipenem/relebactam for which FDA breakpoints were used.
- **The traditional antibiogram** includes susceptibility data for the 3 most common gram-negative pathogens from all sources and represents critical pathogens considered for empiric antibiotic coverage.
- **The syndromic antibiogram** includes susceptibility data for the 3 most common gram-negative pathogens isolated from a respiratory source.
- A targeted empiric antibiotic susceptibility of ≥90% against likely gram-negative organisms was selected based on ATS/IDSA and International HAP/VAP guidelines.[1,2]
- Aggregated susceptibilities of the 3 most common gram-negative pathogens were used for comparisons between traditional and syndromic antibiograms before and after stratification by patient location (Emergency room (ER), ward, or intensive care unit (ICU)

Citations

[1]Kalil AC, et al. *Clin Infect Dis* 2016;63(5):e61-e111.
[2]Torres A, et al. *Eur Respir J* 2017;50:1700582; https://doi.org/10.1183/13993003.00582-2017

https://bit.ly/34bISRW

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Results

- A total of 17,561 gram-negative isolates, including 6,654 lower respiratory isolates, were evaluated.
- The top 3 most common pathogens isolated were *E. coli* (n=6,095,44%), *Klebsiella* spp. (n=4097, 30%), and *P. aeruginosa* (n=3649, 26%).
- As displayed in **Table 1**, susceptibilities were consistently near or above the 90% threshold for *E. coli* and *Klebsiella* spp. In contrast, cefepime, piperacillin/tazobactam, and meropenem did not achieve this target for *P. aeruginosa*.

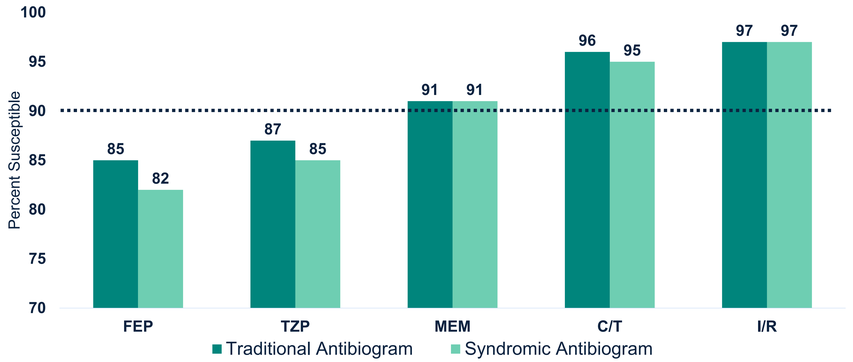
Table 1. Traditional antibiogram evaluating susceptibility for *E. coli*, *Klebsiella* spp., and *P. aeruginosa* collected from all sources.

Pathogen (n)	FEP	TZP	MEM	C/T	I/R
E. coli (6,095)	87	95	99	98	99
Klebsiella spp. (4,097)	91	89	98	95	99
P. aeruginosa (3,649)	78	78	77	95	93

FEP, Cefepime; TZP, piperacillin/tazobactam; MEM, meropenem; C/T, ceftolozane/tazobactam; I/R, imipenem/relebactam

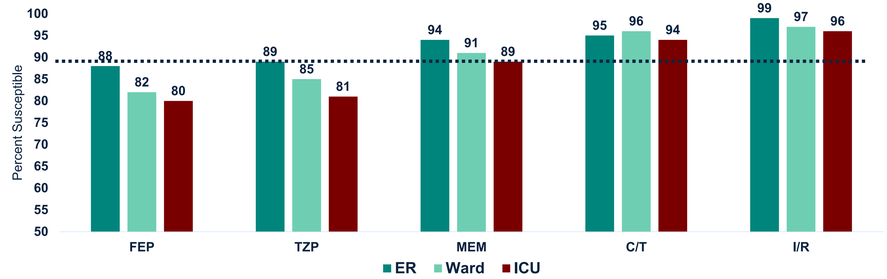
- Filtering data to only isolates collected from the lower respiratory tract yielded *P. aeruginosa* (n = 1997, 52%), *Klebsiella* spp. (n = 1190, 31%), and *E. coli* (n = 637, 17%).
- **Figure 1** displays aggregate susceptibilities of the top 3 pathogens and shows similar findings when comparing traditional and syndromic antibiograms.
- These aggregated data for common pathogens reveal an inability to achieve the 90% threshold for cefepime and piperacillin/tazobactam in both antibiogram types.

Figure 1 .Traditional antibiogram versus respiratory syndromic antibiogram evaluating aggregate susceptibility for *E. coli*, *Klebsiella* spp., and *P. aeruginosa*.



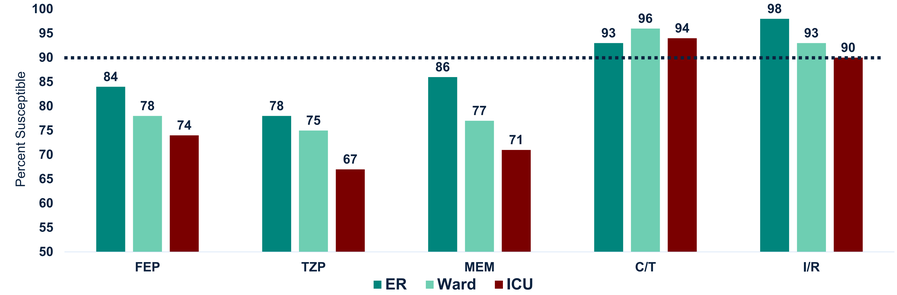
- Stratifying by patient location (**Figure 2**) resulted in a ~5-8% reduction in aggregate susceptibility for cefepime, piperacillin/tazobactam, and meropenem in ER versus ICU specimens.

Figure 2. Respiratory syndromic antibiogram evaluating aggregate susceptibility data stratified by patient location.



- Upon further refinement of this analysis to *P. aeruginosa* (**Figure 3**), a ≥10% reduction in susceptibility for cefepime, piperacillin/tazobactam, and meropenem was observed in samples collected from the ICU as compared to the ER, highlighting an effect of patient location on organism susceptibility.
- In contrast, ceftolozane/tazobactam and imipenem/relebactam maintained ≥ 90% susceptibility regardless of organism and patient location.

Figure 3. Respiratory syndromic antibiogram evaluating susceptibility of *P. aeruginosa* respiratory isolates stratified by patient location.



Conclusions

- Traditional antibiograms are useful tools for choosing empiric therapy and tracking resistance. Despite their utility, variability in susceptibility by clinical syndrome and/or patient location may impact empiric therapy decisions.
- In this analysis, traditional antibiogram data underestimated resistance patterns observed in ICU patients with respiratory tract infections which may result in the delivery of ineffective therapy.
  - The largest impact was observed with meropenem as the ability to achieve a 90% threshold for organism coverage was lost when considering patient location and site of infection.
- Use of syndromic antibiograms stratified by geographic location provides a level of granularity that increases awareness of resistance and may optimize empiric therapy recommendations.