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Removal of Enterococcus susceptibilities in urine isolates across a large integrated health system

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Removal of *Enterococcus* susceptibilities in urine isolates across a large integrated health system

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Background

- In hospitalized patients with a urinary tract infection (UTI), 15-30% of these infections are caused by an *Enterococcus spp*. Aminopenicillins are the preferred antibiotic in treating these infections.
- Aminopenicillins concentrate in the urine and can overcome the elevated minimum inhibitory concentration observed in resistant *Enterococcus spp.*
  - An in vitro susceptibility report may indicate that a culture is resistant to aminopenicillins, but in vivo the species would very likely be susceptible due to this increased antibiotic concentration in urine.
- Studies support this concentration theory and have shown that cure rates were similar in patients with vancomycin resistant *Enterococcus spp.* UTI that were treated with aminopenicillins compared to non-β-lactam agents despite the reported resistance.
- A west coast health system decided to cease routine susceptibility testing in *Enterococcus spp*. urine cultures starting in 2022. The susceptibility report was replaced by a message instructing clinicians that amoxicillin was the drug of choice for enterococcus cystitis and to request susceptibility testing for complicated or upper tract infections cultures.

Purpose of Study

- Compare patient outcomes before and after the change in routine susceptibility reporting.

Objectives

Primary Outcome

Clinical Treatment Failure, defined as:

Escalation in Therapy
- initiation of daptomycin, linezolid, or vancomycin within 48 hours of culture result

Relapse in Therapy
- *Enterococcus spp.* urine culture within 28 days of original culture that was treated with an antibiotic

Admission/Readmission
- Admission (outpatient cultures) or readmission (inpatient cultures) for urinary symptoms within 28 days of original culture

Secondary Outcomes
- Antibiotic class used, duration of treatment, culture sensitivities

Subgroup analyses
- CAUTI, UTI/Cystitis, allergy to antibiotic, gender, *Enterococcus spp.*

Methods

Study Design
- Quasi-experimental, retrospective cohort

Study Population
- Pre-Post Susceptibility Reporting Change
  - Pre-Cohort: 7/1/2021 – 2/20/2022
  - Post-Cohort: 2/21/2022 – 9/30/2022

Inclusion Criteria
- Age >17 years old, diagnosis of cystitis/UTI/CAUTI, *Enterococcus spp.* urine culture and treated with antibiotics within 5 days

Exclusion criteria
- Polymicrobial urine culture, diagnosis of pyelonephritis, positive blood culture within 48 hours prior or after urine culture

Trial Profile

Between 7/1/2021 - 9/30/2022 there were 936 Urine Cultures (amongst 865 patients) identified as having an *Enterococcus spp.*

Patients Excluded = 642
- 433 for a polymicrobial urine culture
- 34 for positive blood culture
- 44 for concurrent infection that affected antibiotic selection
- 23 patients were deceased within 28 days of culture
- 21 patients diagnosed with pyelonephritis
- 3 antibiotics started >5 days after original culture
- 84 not treated with antibiotics

223 patients included in study

106 patients before susceptibility reporting change	117 patients after susceptibility reporting change

7 patients met primary outcome
• 4 for Admission/Readmission
  • 2 UTI, 2 CAUTI
• 3 for Relapse
  • 2 UTI, 1 CAUTI
	10 patients met primary outcome
	• 5 for Admission/Readmission
	  • 5 UTI
	• 5 for Relapse
	  • 3 UTI, 2 CAUTI

Culture Sensitivities

Pre-Cohort: 508 cultures
- 479/508 had sensitivities
- 22/479 resistant to amoxicillin
- 12/22 resistant to vancomycin

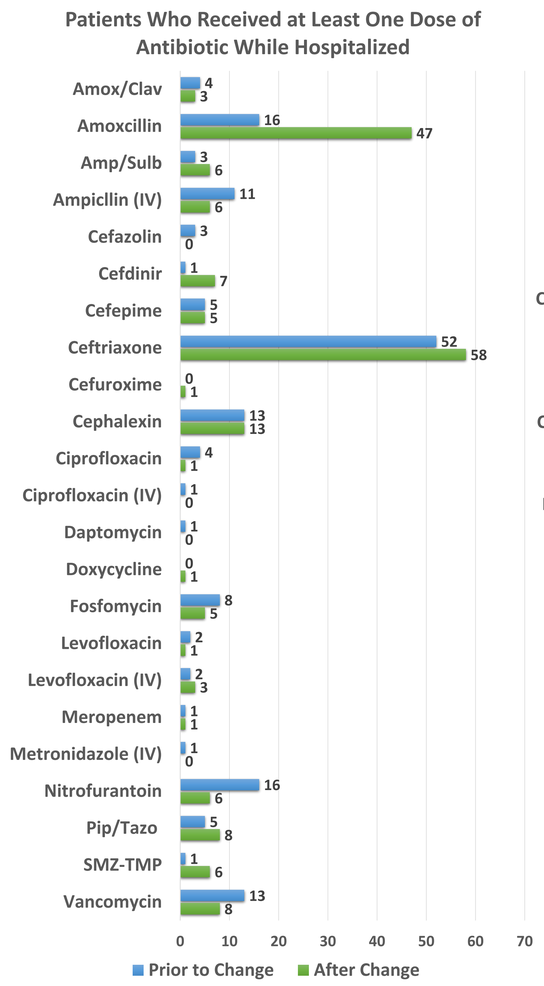
Post-Cohort: 478 cultures
- 59/478 had sensitivities,
- 7/59 resistant to amoxicillin
- 5/7 resistant to vancomycin

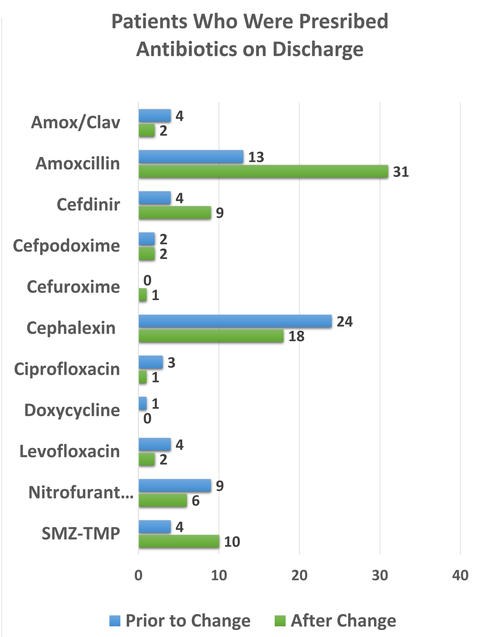
Primary outcome: 17 cultures
- 7/17 had sensitivities
- No resistances reported

Economic Impact

We estimate that ceasing routine susceptibility testing in *Enterococcus spp.* could lead to a $7-11K annual savings in microbiology lab costs.

Effect on Antibiotic Prescribing Patterns





Pre-Cohort: 69/106 had discharge antibiotic
Post-Cohort: 86/117 had discharge antibiotic

There was a statistically significant increase in amoxicillin prescribing both during admissions ($p < 0.001$), and on discharge ($p < 0.011$) after the susceptibility reporting change.

Discussion

Results
- There were 865 patients identified with an *Enterococcus spp.* UTI and 642 were excluded.
- In the Pre-Cohort, 7/106 patients met criteria for clinical failure compared to 10/116 in the Post-Cohort ($p = 0.77$), a non-significant difference in outcomes.
- Amoxicillin use significantly increased, presumably leading to a reduced use of alternate antibiotics
  - Further analysis required to confirm

Observations
- During chart reviews there was an unexpected observation that on multiple occasions patients were prescribed cephalosporins for *Enterococcus spp.* cultures despite intrinsic resistance.
  - Prescribers may have been unaware of the resistance and assumed that the culture would be sensitive to cephalosporins since it could be treated with amoxicillin.

Limitations
- Charts were reviewed by a single individual.
- Cultures were from one region of the hospital system
  - Results may vary in other regions with alternate resistance/prescribing patterns.
- Nearly 75% of patients met exclusion criteria, highlighting that a multifactorial approach is typically required when selecting an antibiotic regimen.

Conclusion

- Based on the preliminary data analysis, our tentative conclusions are that ceasing routine susceptibility reporting did not adversely affect patients and it had a significant impact on increasing amoxicillin prescribing.
- Health systems could consider adopting this antimicrobial stewardship initiative. This is a safe, effective, and easy way to promote the appropriate narrowing of antibiotics in patients who qualify, while also saving time and money in microbiology lab costs.

Going Forward

- Complete analysis on duration of antibiotic use and assess if there were any changes
- Complete analyses of pre-determined subgroups
- Evaluate the economic impact of the increased amoxicillin use while hospitalized
- Study could be repeated for other regions of the health system to confirm validity of results
- Would be prudent to advocate for *Enterococcus spp.* cultures to include in their susceptibility report a reminder that *Enterococcus spp.* have intrinsic resistance to cephalosporins

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