

Utilizing the Electronic Health Record to Construct Syndrome-Specific Antibigrams for Previously Healthy Children

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Background

- Institutional antibiograms are recommended to guide empiric antibiotic therapy^{1,2} but have limitations.
- Traditional antibiograms rely on composite susceptibility data and may miss differences in resistance across patient sub-populations or clinical syndromes.
- Antibiotic susceptibilities for community-associated skin and soft tissue infections (SSTI) and urinary tract infections (UTI) in previously healthy children may differ from susceptibilities for the general pediatric population.

Objective

- Construct automated antibiograms for two common pediatric syndromes—community-associated UTIs and SSTIs—for previously healthy children.
- Compare the antibiograms of healthy children with traditional antibiograms including all children.

Methods

- **Study Description:** Retrospective descriptive study.
- **Subjects:** Patients ≤21 years at Lurie Children's Hospital with specimens obtained from inpatient and outpatient locations.
- **Study Procedures:**
 - Antimicrobial susceptibility data from *Staphylococcus aureus* isolates from skin and soft tissue body sites (Oct 1st, 2015, to May 1st, 2017) and Gram negative bacilli from urine isolates (Oct 2nd, 2016, to May 1st, 2017) were summarized.
 - Using administrative & pharmacy data from the electronic health record (EHR), we constructed a cohort of healthy children, i.e. those without ICU admissions, comorbidities (using ICD-10 coding for complex conditions³), prior admissions (within 1 year), or recent antibiotic use (within 90 days).
 - We generated syndrome-specific antibiograms based on collective susceptibilities for common empiric antibiotics.
 - The sensitivity & specificity of our metric for healthy children was compared with manual review of the medical record for 100 patients with each syndrome.
- **Data Collection:** Vigilanz™ (Vigilanz Corp, Minneapolis, MN)
- **Statistical Analysis:** Fisher's exact test.

Results

Table 1. Antibiotic Susceptibilities for SSTIs

Antibiotic	All Patients	Healthy Patients Only	P-value
Oxacillin	71.3% (547/767)	73.7% (205/278)	0.483
Clindamycin	77.6% (595/767)	81.7% (227/278)	0.172
Erythromycin	49.8% (383/767)	53.2% (128/278)	0.328
TMP/SMX	89.7% (576/642)	92.6% (213/230)	0.239

Table 2. Antibiotic Susceptibilities for UTIs

Antibiotic	All Patients	Healthy Patients Only	P-value
Amoxicillin/Clavulanate	77.0% (622/808)	85.7% (347/405)	0.0003*
Ampicillin	37.4% (302/808)	42.5% (172/405)	0.0922
Cefazolin	58.3% (471/808)	65.4% (265/405)	0.0179*
Ceftriaxone	86.17% (698/810)	92.1% (373/405)	0.0025*
TMP/SMX	70.5% (246/349)	76.5% (137/179)	0.15

Table 3. Comparison of Study EHR Metric vs Manual Review (Gold Standard) for Identifying Healthy Children

Syndrome	Sensitivity	Specificity
SSTI	40.9% (27/66)	88.2% (30/34)
UTI	88.2% (30/34)	74.2% (49/66)

Conclusions

- We demonstrated the feasibility of constructing EHR-derived syndrome-specific antibiograms for a cohort of children without chronic medical conditions.
- For UTIs, automated antibiograms for previously healthy children can avoid overestimation of resistance and may better guide initial empiric therapy (Table 2).
- In our study population, our methodology was limited for SSTIs, and no significant differences in susceptibilities were found for community-associated SSTIs (Table 1).
- Our EHR-based algorithm was highly sensitive and specific for identifying healthy children with UTIs (Table 3).
- Our methodology may be modified to create antibiograms for a variety of clinical syndromes or patient sub-populations.

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References

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