Poster #2103

Comparison of Antibiograms Across Solid Organ Transplant Services Within a Medical Center

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Abstract:

Antibiograms summarize localized antimicrobial susceptibilities and are used to guide empiric antibiotic therapy. Antibiograms for subpopulations may offer more meaningful clinical data, especially in immunocompromised hosts who may be at higher risk for multidrug-resistant organisms. However, population-specific antibiograms are uncommon. The purpose of this study is to evaluate whether service-specific antibiograms provide more useful information than hospital-wide antibiograms.

This is a retrospective, single-center study that included bacterial isolates from all body sites collected between 2017-2020. Antibiograms were created in accordance with the Clinical and Laboratory Standards Institute (CLSI) guidelines, with susceptibilities reported as a percentage and a 95% confidence interval. A combined solid organ transplant (SOT) antibiogram and individual antibiograms based on the transplanted organ (heart, lung, liver, and kidney) were compared to a hospital antibiogram with a difference of ≥ 10% considered clinically significant.

In the combined SOT antibiogram, *Escherichia coli*, *Klebsiella aerogenes*, and *Klebsiella pneumoniae* susceptibilities were lower for antibiotics such as ceftriaxone, ceftazidime, and ciprofloxacin compared to the hospital antibiogram. Overall susceptibilities for *Pseudomonas aeruginosa* in the SOT antibiogram were comparable to that of the hospital antibiogram; however piperacillin-tazobactam susceptibilities were substantially lower among lung and heart transplant patients. Among *Staphylococcus aureus* isolates, clindamycin susceptibilities were similar between the SOT antibiogram and hospital antibiogram. This was a result of lower susceptibilities among lung transplant patients, offset by greater susceptibility in liver, kidney, and heart transplant patients.

Clinically significant differences were seen in susceptibilities for several antibiotics against gram-negative and gram-positive pathogens in various transplant antibiograms. The combined SOT antibiogram minimized substantial between-service differences. Through population-specific antibiograms, providers may be able to improve empiric antibiotic therapy selection for their patient population.

Background:

Utility of a service-specific antibiogram

- Immunocompromised patients:
  - Higher incidence of antimicrobial-resistant organisms[1]
    - Compromised immune systems
    - Frequent hospitalizations
    - Antimicrobial exposure

Objective:

- To evaluate whether a combined and/or service-specific SOT antibiogram provides more useful information than a hospital-wide antibiogram
- To analyze how granular antibiograms need to be to provide meaningfully different results

Methods:

Study Design:

- Retrospective, single-center analysis
- Antibiograms created in accordance with the CLSI guidelines[2]

Inclusion Criteria:

- Culture isolates collected at UCSF Medical Center
  - Time period: 2017-2020
  - Clinical submitted from an inpatient location
  - Collected from all body sites
- First isolate reported per patient per calendar year
- Organisms with ≥ 30 isolates
  - If < 30 isolates, organism marked with asterisk

Exclusion Criteria:

- Age < 18 years old
- Mucoid *Pseudomonas* strains

Primary Analysis

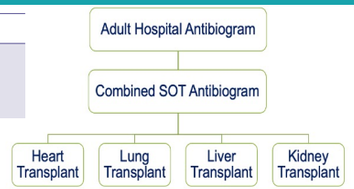
- Difference in antimicrobial susceptibility between combined SOT antibiogram and hospital antibiogram

Secondary Analyses

- Difference in antimicrobial susceptibility between transplant service-specific antibiograms and hospital antibiogram

Statistical Analysis:

- Percentage of isolates susceptible to an antibiotic with 95% confidence intervals (95% CI)
- Comparisons with non-overlapping 95% CIs considered *statistically significant*
- Differences above or below ± 10% considered **clinically significant**



	Total Isolates	CTX	ERTA	CTAZ	CFPM	TOB	CIP	PIP/TAZ	MER
Escherichia coli									
All inpatients	3983	78% (76-79%)	99% (99-100%)	86% (85-87%)	86% (85-87%)	85% (84-86%)	64% (63-66%)	96% (95-96%)	99% (99-100%)
Combined SOT	343	↓ 66% (61-71%)[1]	99% (97-100%)	77% (72-81%)[1]	77% (72-81%)[1]	76% (71-81%)[1]	↓ 52% (46-57%)[1]	94% (91-96%)	99% (97-100%)
Lung transplant	23*	↓ 57% (34-77%)	96% (78-100%)	↓ 74% (52-90%)	↓ 65% (42-84%)[2]	↓ 57% (34-77%)[2]	↓ 30% (13-53%)[2]	↓ 86% (66-97%)	100%
Heart transplant	40	↓ 65% (48-79%)	100%	↓ 70% (53-83%)[2]	↓ 75% (59-87%)	↓ 73% (56-85%)	63% (46-77%)	↓ 83% (67-93%)[2]	100%
Liver transplant	91	↓ 59% (49-70%)[2]	99% (94-100%)	↓ 69% (59-78%)[2]	↓ 74% (63-82%)[2]	↓ 71% (60-80%)[2]	↓ 44% (34-55%)[2]	90% (82-95%)	99% (94-100%)
Kidney transplant	189	70% (63-77%)	99% (97-100%)	83% (76-88%)	82% (76-87%)	82% (76-87%)	↓ 56% (49-63%)	94% (89-97%)	100%
Pseudomonas aeruginosa									
All inpatients	1168			89% (87-90%)	91% (89-93%)	98% (98-99%)	87% (85-89%)	84% (82-86%)	88% (86-90%)
Combined SOT	113			87% (79-92%)	85% (77-91%)	98% (94-100%)	83% (75-90%)	79% (70-86%)	87% (79-92%)
Lung transplant	29*			82% (64-94%)	86% (68-96%)	100%	↓ 68% (49-85%)	↓ 68% (49-85%)	89% (73-98%)
Heart transplant	42	N/A	N/A	↓ 79% (63-90%)	↓ 76% (61-88%)[2]	95% (84-99%)	88% (74-96%)	↓ 69% (53-82%)	79% (63-90%)
Liver transplant	18*			94% (73-100%)	83% (59-96%)	100%	83% (59-96%)	89% (65-99%)	83% (59-96%)
Kidney transplant	24*			↑ 100%	100%	100%	92% (73-99%)	↑ 100%	↑ 100%
Staphylococcus aureus		AMP	NAF	CLIN	DOX	T/S	VANC	DAP	LZD
All inpatients	2887		66% (64-67%)	72% (71-74%)	92% (91-93%)	95% (94-96%)	100%	99% (99-100%)	99% (99-100%)
Combined SOT	243		68% (62-74%)	76% (70-81%)	93% (89-96%)	92% (88-95%)	100%	99% (97-100%)	99% (97-100%)
Lung transplant	55		↓ 55% (41-68%)	↓ 51% (37-65%)[2]	87% (76-95%)	↓ 80% (67-90%)[2]	100%	100%	100%
Heart transplant	129	N/A	73% (64-80%)	↑ 84% (76-90%)[2]	94% (88-97%)	98% (93-100%)	100%	98% (93-100%)	99% (96-100%)
Liver transplant	37		70% (53-84%)	↑ 84% (68-94%)	100%	92% (78-98%)	100%	100%	100%
Kidney transplant	22*		73% (50-89%)	↑ 82% (60-95%)	86% (65-97%)	86% (65-97%)	100%	100%	100%

CTX = ceftriaxone, ERTA = ertapenem, CTAZ = ceftazidime, CFPM = cefepime, TOB = tobramycin, CIP = ciprofloxacin, PIP/TAZ = piperacillin-tazobactam, MER = meropenem, AMP = ampicillin, NAF = nafcillin, CLIN = clindamycin, DOX = doxycycline, T/S = trimethoprim-sulfamethoxazole, VANC = vancomycin, DAP = daptomycin, LZD = linezolid, N/a=not applicable
[1]statistically significant difference combined SOT vs all inpatients [2]statistically significant difference individual service vs hospital antibiogram
*Interpret susceptibilities with caution given < 30 total isolates

Results:

- **Complete results available via QR code link** →
- **Key pathogens highlighted in Tables**
- **Combined SOT antibiogram vs Hospital antibiogram:**
  - *E. coli*: susceptibilities lower for cephalosporins & CIP. No differences in carbapenem susceptibilities.
  - *P. aeruginosa:* overall susceptibilities comparable to hospital antibiogram
  - No clinically or statistically significant differences amongst gram-positive organisms compared to hospital antibiogram
- **Lung transplant antibiogram vs Hospital antibiogram**
  - *E. coli*:* susceptibilities lower for CTX, CTAZ,CFPM, TOB, CIP,PIP/TAZ
  - *P. aeruginosa*:* susceptibilities lower for CIP and PIP/TAZ
  - *S. aureus:* lower susceptibilities to NAF, CLIN and T/S
- **Heart transplant antibiograms vs Hospital antibiogram**
  - *E. coli:* susceptibilities lower for CTAZ, CFPM, PIP/TAZ
  - *P. aeruginosa:* susceptibilities lower for CFPM, CTAZ and P/T
  - *S. aureus:* higher susceptibilities to CLIN
- **Liver transplant antibiograms vs Hospital antibiogram**
  - *E. coli:* susceptibilities lower for CTX, CTAZ, CFPM, TOB, CIP
  - *P. aeruginosa**: susceptibilities similar to combined SOT
  - *S. aureus:* higher susceptibilities to CLIN
- **Kidney transplant antibiograms vs Hospital antibiogram**
  - *E. coli:* susceptibilities lower for CIP
  - *P. aeruginosa**: similar to higher susceptibilities
  - *S. aureus*:* higher susceptibilities to CLIN

Conclusions:

- Significant differences seen in percent susceptibility for several antibiotics against **gram-negative pathogens** for **combined SOT vs total inpatient antibiogram**
- **Combined SOT antibiogram** minimized **substantial between-service differences** for several antibiotics
- **Carbapenem susceptibility** showed **less variability** compared to hospital antibiogram & between services
- **Fewer significant differences** seen in percent susceptibility amongst **gram-positive pathogens** in individual transplant antibiograms
- Creation of **population-specific antibiograms** may **improve empiric antibiotic selection** and help monitor antimicrobial resistance patterns within patient populations

Limitations:

- **Single-center study**
- **Pooling across multiple years required** in order to obtain adequate number of isolates
- All isolates collected during hospitalization as standard of care but **unable to distinguish active infection vs. colonization**
- Requires further evaluation of **how this data will be used by providers**

References:

1. Kitano T, Science M, Nalli N, et al. Solid organ transplant-specific antibiogram in a tertiary pediatric hospital in Canada. Wiley: 2001;25:e13980.
2. CLSI. Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data. 4th Edition. M39-A4. Wayne, PA: Clinical and Laboratory Institute; 2014.