Evaluation of antimicrobial susceptibility patterns for patients admitted from post-acute care facilities in the Philadelphia region

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Background

- Timely initiation of antimicrobial therapy is essential to decreasing mortality associated with bacterial infections, and antibiograms are a key tool in the determination of appropriate empiric therapy[1-2]
- Patients admitted from nursing homes have a higher incidence of multi-drug resistant organisms[3,4]
- Currently, there is a lack of published studies evaluating resistance rates for all sources of infections with direct comparison to an inpatient antibiogram
- Current antibiograms for Penn Presbyterian Medical Center (PPMC) and the Hospital of University of Pennsylvania (HUP) do not delineate between patients admitted from the community vs PACFs

Purpose

This study aims to characterize empiric antimicrobial therapy, pathogens isolated, and susceptibility patterns for patients admitted from PACFs in the Philadelphia region.

Objectives

Primary objective:
Characterize the antimicrobial susceptibilities of culture-proven infections for patients admitted from PACFs

Secondary objectives:
1) Identify discordance between empiric antimicrobial selection and antimicrobial susceptibilities
2) Evaluate mortality in patients receiving inappropriate empiric antimicrobial therapy

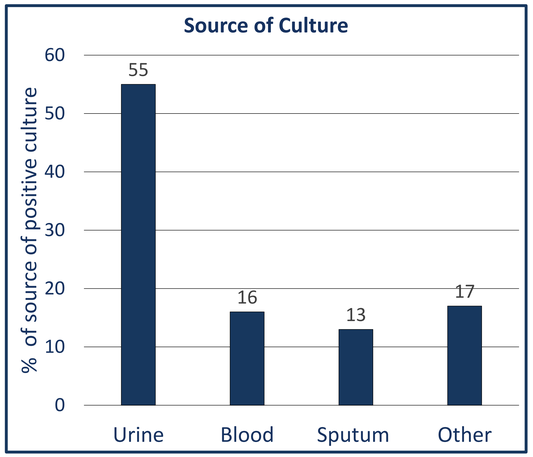
Methods

- Retrospective quality improvement study, August 2020 to June 2021
  - This project was reviewed and determined to qualify as quality improvement by the University of Pennsylvania's Institutional Review Board
- *Inclusion criteria:* patients admitted to PPMC or HUP from a PACF with a culture proven positive culture within 72 hours of admission
- All pertinent information was obtained via the electronic medical record

Results

Demographics and Current Admission (n=110)	
Admitting hospital – no. (%)	
PPMC	62 (56)
HUP	48 (44)
Allergies – no. (%)	
B-lactam allergies	14 (12.7)
Fluoroquinolone allergies	2 (1.8)
Sulfa and other allergies	6 (5.5)
Type of facility patient was admitted from – no. (%)	
SNF – skilled nursing facility	98 (89.1)
LTACH – long-term acute care hospital	7 (6.4)
IRF – inpatient rehabilitation facility	5 (4.5)
Patients admitted to health-system in the past 90 days – no. (%)	68 (61.8)
Appropriate empiric therapy – no. (%)	73 (66.4)
History of MDRO* – no. (%)	11 (10)
ID consult at the time of antibiotic initiation – no. (%)	8 (7.3)
In-hospital mortality – no. (%)	9 (8.2)
Inappropriate empiric therapy (n=36)	1 (1.9)
Readmission to health-system within 30 days – no. (%)	33 (30)

*Multi-drug resistant organism



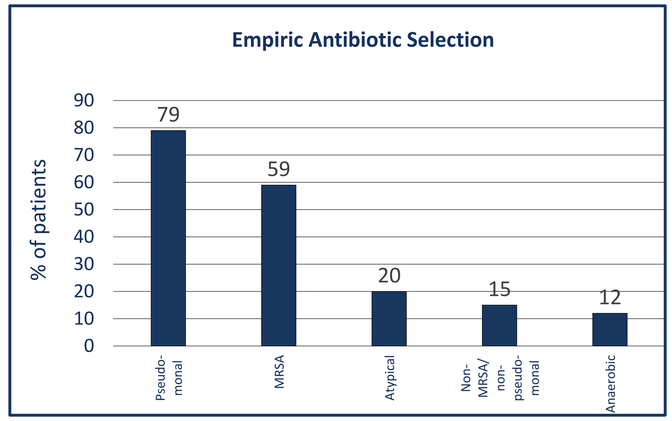
Gram-Positive Organisms – no. (%)	
***Enterococcus* spp.**	19 (17)
E. faecalis	12 (63)
E. faecium (ampicillin-R)	5 (26)
E. faecium (vancomycin-R)	5 (26)
***Staphylococcus* spp.**	10 (9)
MRSA*	5 (50)
MSSA**	3 (30)
Coagulase-negative staphylococci	2 (20)
***Streptococcus* spp.**	2 (2)

*Methicillin-resistant *Staphylococcus aureus*
** Methicillin-susceptible *Staphylococcus aureus*

Gram-negative susceptibilities for common empiric antimicrobial therapy

Gram-negative organisms	Cefepime		Ceftriaxone		Levofloxacin		Meropenem		Piperacillin/ tazobactam	
	PACF *(UPHS)*	Delta	PACF *(UPHS)*	Delta	PACF *(UPHS)*	Delta	PACF *(UPHS)*	Delta	PACF *(UPHS)*	Delta
***E. coli* (n=32)**	65.6% *(94%)*	**-28.4%**	59.3% *(92%)*	**-32.7%**	43.8% *(75%)*	**-31.2%**	100% *(99%)*	1%	82.1% *(97%)*	-14.9%
***K. pneumoniae* (n=19)**	73.7% *(91%)*	-17.3%	68.4% *(90%)*	**-21.6%**	73.7% *(85%)*	-11.3%	84.2% *(98%)*	-13.8%	73.7% *(88%)*	-14.3%
***P. mirabilis* (n=29)**	82.8% *(98%)*	-15.2%	82.8% *(98%)*	-15.2%	44.8% *(81%)*	**-36.2%**	100% *(100%)*	0%	82.8% *(98%)*	-15.2%
***P. aeruginosa* (n=17)**	94% *(91%)*	-3%	-	-	52.9% *(74%)*	**-21.1%**	64.7% *(90%)*	**-25.3%**	76.5% *(89%)*	-12.5%

Results Continued



Discussion/Conclusion

- A clinically significant increase in antimicrobial resistance in the post-acute care patient population admitted to our institutions
- A majority of the cohort was initiated on antimicrobial therapy that included coverage of *P. aeruginosa* and/or MRSA
  - Greatest concern with the evolution of resistance, particularly ESCR-Es due to their high likelihood of phenotypic occurrence
- Notable differences in susceptibility with PACF patients vs our current antibiogram
  - Meropenem to *P. aeruginosa* (64.7% vs 90%)
  - Cefepime to *E. coli* (65.6% vs 94%)
  - Levofloxacin to *P. mirabilis* (44.8% vs 81%)
- Overall rate of gram-positive isolates was low, noting a high percentage of MRSA isolates
- Limitations
  - Inclusion of patients limited to the Philadelphia area, restricting external validity
  - Number of isolates included in analysis, requiring an expansion of time frame beyond one year
  - In alignment with health-system antibiogram reporting process, all positive isolates were included without evaluation of clinical infection
- Rates of resistance are notable and present an opportunity for optimization of prescribing practices within UPHS

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