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# Evaluation of outpatient telephone prescribing of antibiotics for acute pulmonary exacerbation in children with cystic fibrosis

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## Introduction

- People with cystic fibrosis (CF) often suffer from pulmonary exacerbations, which result in permanent loss of lung function, worse quality of life, and shortened survival.
- Acute pulmonary exacerbations (APE) are recurrent, acute flare-ups of lung infections. Common bacteria pathogens include methicillin-sensitive *Staphylococcus aureus* (MSSA), methicillin-resistant *Staphylococcus aureus* (MRSA), *Stenotrophomonas maltophilia* (SM), *Pseudomonas aeruginosa* (PA), and *Haemophilus influenzae* (HI).
- There is currently no standard outpatient management for APE, but treatment typically includes oral antimicrobials and increased airway clearance therapy.

## Objective

This study aims to evaluate the appropriate use of outpatient antibiotics provided via a telephone encounter in patients with APE of CF.

## Methods

Study Design: Retrospective, chart review of patients receiving care at Cardinal Glennon Children's Hospital (CGCH) CF Clinic
Data Source: CGCH electronic medical records
Study Period: May 01, 2017 to May 01, 2022
Inclusion Criteria:
- Patient enrolled at the CGCH CF clinic
- Treated outpatient for an APE via telephone encounter

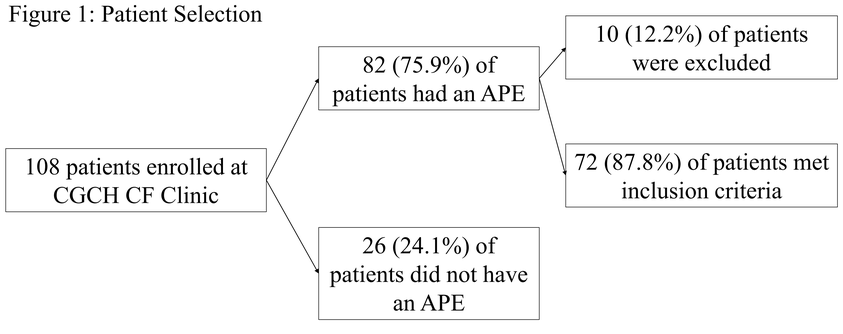
Exclusion Criteria:
- Received an eradication antibiotic for PA
- CFTR-related metabolic syndrome

Descriptive statistics were used to report age, gender, microbiology results, and antibiotic regimen.

**Table 1: Appropriate Bug-Drug Selection**

| Bug | Drug |
|---|---|
| MSSA | Dicloxacillin or cephalexin<br>*Consider clindamycin, SMX/TMP, or minocycline/doxycycline for an allergy |
| MRSA | SMX/TMP, minocycline, doxycycline, or linezolid<br>*Consider clindamycin if susceptible |
| SM | SMX/TMP, minocycline, or levofloxacin |
| PA | Ciprofloxacin, levofloxacin, inhaled tobramycin, inhaled colistin, or inhaled aztreonam |
| HI | Amoxicillin-clavulanate |

Figure 1: Patient Selection




## Patient Demographics

**Table 2: Patient Demographics**

| Characteristic | Patients n = 72 |
|---|---|
| Male, n (%) | 36 (0.5) |
| Age (Years), Median (IQR) | 9 (8) |
| Range | 4 Months to 18 Years |
| Highly Effective Modulator Therapy, n (%) | 60 (83.3) |
| CF Genetics | |
| Homozygous, n (%) | 41 (56.9) |
| Heterozygous, n (%) | 30 (41.7) |
| Neither, n (%) | 1 (1.4) |
| Total Number of Respiratory Cultures | 60 |
| Total Number of Antibiotics | 72 |

## Results

Figure 2: Overall Culture Results

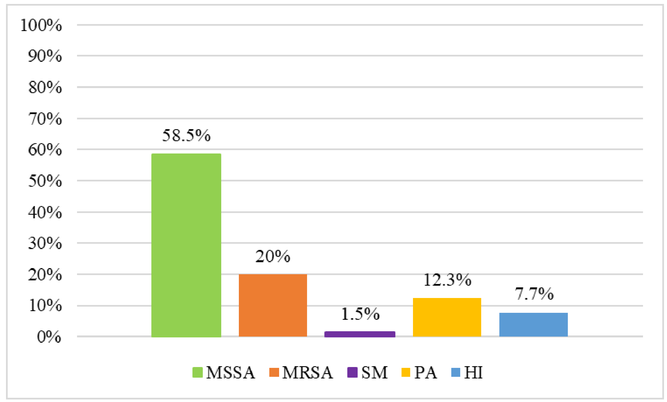



Figure 3: Multiple vs Single Organism Culture Results

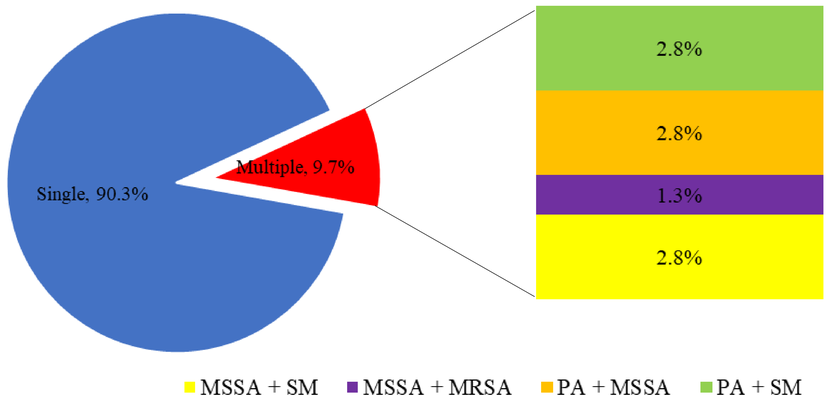
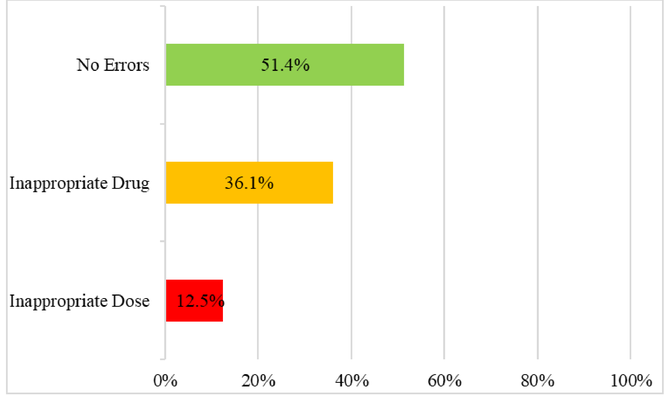



**Table 3: Antibiotic Selection**

| Antibiotic | Patients Prescribed n (%) |
|---|---|
| Amoxicillin-Clavulate | 23 (31.9) |
| SMX/TMP | 14 (19.4) |
| Cephalexin | 12 (16.7) |
| Levofloxacin | 4 (5.60) |
| Ciprofloxacin | 3 (4.2) |
| Doxycycline | 3 (4.2) |
| INH Aztreonam | 3 (4.2) |
| Linezolid | 2 (2.7) |
| Minocycline | 2 (2.7) |
| Amoxicillin | 1 (1.4) |
| Cefadroxil | 1 (1.4) |
| Cefdinir | 1 (1.4) |
| Clindamycin | 1 (1.4) |
| Metronidazole | 1 (1.4) |
| INH Tobramycin | 1 (1.4) |

Figure 4: Antibiotic Prescribing Errors




## Results

Figure 5: Outcomes of Inappropriate Therapy

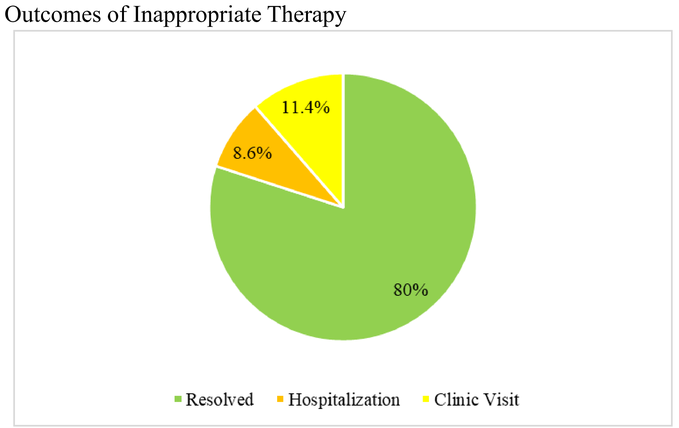
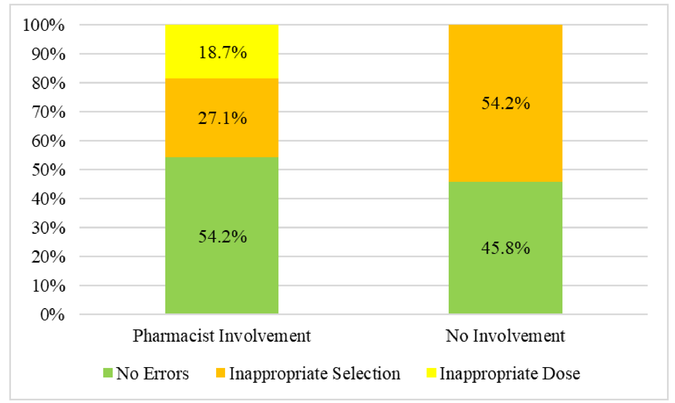



Figure 6: Pharmacist Involvement




## Discussion

- The majority of patients respiratory cultures resulted in single organism growth of MSSA (58.5%).
- The most prescribed antibiotic was amoxicillin-clavulate, followed by SMX/TMP and cephalexin.
- About half of patients received inappropriate antibiotic therapy.
- Of those errors, 74.3% received an inappropriate drug and 25.7% received an inappropriate dose.
  - 20% low frequency
  - 5.7% low dose
- Although most APEs resolved with the prescribed antibiotic, there were 3 (8.6%) hospitalizations.
- The pharmacist was involved 66.7% of the time, with the majority of prescriptions resulting in no errors.
- There was no involvement of the pharmacist for 33.3% of encounters.
  - 18.1% resulted in errors
- Limitations: Small sample size and single center

## Conclusions

- Most patients experienced a resolution of their symptoms despite almost half being provided an inappropriate antibiotic regimen via a telephone encounter.
- When pharmacists are involved in outpatient antibiotic prescriptions for APEs, medication errors may be reduced.

## References