Prescribing Trends of Antibiotics in Patients with Documented Beta-Lactam Allergy or Intolerance

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Background

- Approximately ten percent of patients will report a penicillin allergy, whereas 80–90% of these reported allergies are negative on penicillin skin testing.[1]
- Patient charts lack allergy details, which can complicate antibiotic selection.
- True immediate type reactions must be distinguished from minor reactions or intolerances.
- Labeled allergies may instead be an adverse drug reaction such as a gastrointestinal intolerance or may be caused by a viral infection.[2]
- Patients administered a cephalosporin with a history of penicillin allergy and a positive skin test had an allergic reaction about 5.6% of the time.[2]
- Cross sensitivity is related to similar drug side chains instead of the β-lactam ring itself.[1]
- β-lactam agents should be chosen with dissimilar side chains to avoid a reaction.[1,3]
- Alternative antibiotic selections can lead to increased costs, use, drug resistance, length of stay and adverse reactions.[1]

Table 1. Cross Reactivity

Antibiotic	Antibiotic with Common Side Chain				
Amoxicillin	Cefadroxil	Cefprozil	Ampicillin	Cephalexin	
Ampicillin	Cefaclor	Cephalexin	Cefadroxil	Cefprozil	
Aztreonam	Ceftazidime				
Cefaclor	Amoxicillin	Ampicillin	Cefadroxil	Cefprozil	Cephalexin
Cefdinir	Cefixime				
Cefepime	Ceftriaxone	Cefotaxime	Cefuroxime		
Cefotaxime	Ceftriaxone	Cefepime	Cefuroxime		
Ceftazidime	Aztreonam	Cefixime			
Ceftriaxone	Cefuroxime	Cefotaxime	Cefepime		
Cefuroxime	Ceftriaxone	Cefotaxime	Cefepime	Cefoxitin	
Cephalexin	Amoxicillin	Ampicillin	Cefaclor	Cefadroxil	Cefprozil
Penicillin	Cefoxitin				

**Adapted from Pinchichero et al. Penicillin and cephalosporin allergy. Ann Allergy Asthma Immunol. 112 (2014) 404-412. and Fish J. UWHC guidelines for the use of beta-lactam antibiotics in patients with reported allergies to penicillin. 2011.*

Methods

OBJECTIVE:
The objective of this study is to assess antibiotic prescribing habits in patients with documented beta-lactam allergies or intolerances at Beaumont Hospital – Troy.

Table 2. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
▪ Inpatients at least 18 years old ▪ Documented ß-lactam allergy or intolerance ▪ Received at least one dose of an antibiotic	▪ Pre/post operation antibiotics ▪ Clostridium difficile infection ▪ Infection when a ß-lactam antibiotic is not indicated

Table 3. Definitions

Mild/Moderate Allergy and Intolerance	Rash, itching, nausea, vomiting, hives, generalized swelling, GI distress, fatigue, dizziness, mental status change, flushing, and fainting
Severe Allergy	Anaphylaxis, shock, wheezing, and swelling of lips, tongue, and throat

Figure 1. Study Design

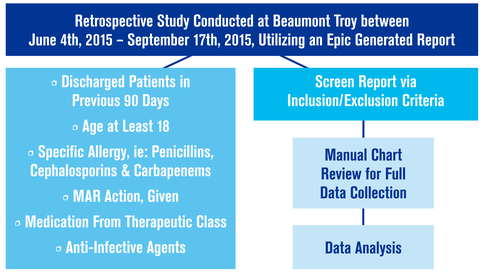


Table 4. Primary Outcomes

Percent of Patients with Previously Documented ß-lactam Allergy and Corresponding Reaction
Percent of patients that received a ß-lactam antibiotic with previously documented: ▪ Mild/moderate ß-lactam allergy or reaction ▪ Severe ß-lactam allergy or reaction ▪ Unknown ß-lactam allergy or reaction
Percent of patients with a previously documented ß-lactam allergy or reaction that received ▪ A ß-lactam antibiotic at the reviewed visit ▪ An alternative antibiotic at the reviewed visit

Results

Table 5. Primary Results

Patients with previously documented ß-lactam allergy and corresponding reaction	**79%**
Percent of patients that received a ß-lactam antibiotic with previously documented:	
▪ Mild/moderate ß-lactam allergy or reaction	40%
▪ Severe ß-lactam allergy or reaction	8%
▪ Unknown ß-lactam allergy or reaction	13%
Percent of patients with a previously documented ß-lactam allergy or reaction that received:	
▪ A ß-lactam antibiotic at the reviewed visit	61%
▪ An alternative antibiotic at the reviewed visit	39%

Table 6. Secondary results

Patients with previously documented ß-lactam allergy and prior ß-lactam use	40%
Patients with a ß-lactam allergy that received a ß-lactam antibiotic and had a reaction	2%
Infectious Disease consult	59%

Figure 2. Patients with previously documented allergy or reaction that received a ß-lactam antibiotic based on study definition

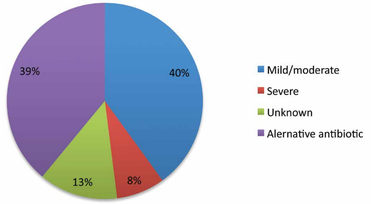
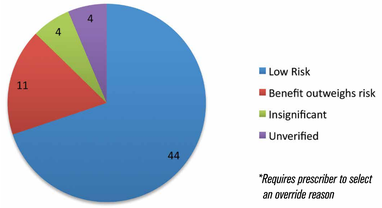


Figure 3. ß-lactam drug-allergy override reasons



**Requires prescriber to select an override reason*

Figure 4. Order sets utilized

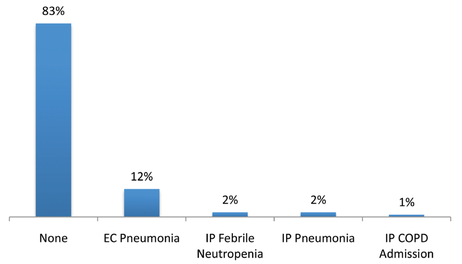


Figure 5. Allergy severity classification

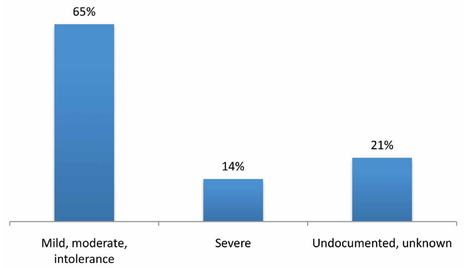
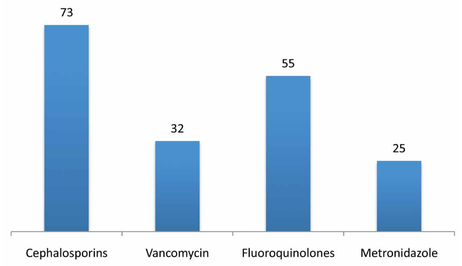


Figure 6. Antibiotics utilized



Discussion

- Approximately 61% of patients were prescribed a β-lactam despite having a previously documented reaction.
- Prescribing of a β-lactam was far more common in patients with previously documented mild/moderate type reactions compared to severe.
- Incomplete or unclear documentation of the nature and severity of allergies is an opportunity for improvement at our institution.
- Order set utilization is not a forcing function and use tends to be low.
- Lack of a standardized definition of mild/moderate/severe type allergies is a limitation to this study.

Conclusion

- Results elucidate the complex nature of imprecise allergy labeling.
- The prescriber's decision to use β-lactam antibiotics is confounded with the poor documentation of allergies with corresponding reaction.
- Of 61% of patients who received a β-lactam antibiotic, 2% had an allergic reaction.
- These findings align with available literature; patients can tolerate β-lactam antibiotics without adverse reactions.

Future Directions

- Educate pharmacy and medical staff on the project findings.
- Investigate the feasibility of penicillin skin testing to confirm true allergies.
- Develop policies, guidelines, and order sets with enhanced allergy guidance.
- Potentiate the focus for an antimicrobial stewardship pharmacist.
- Require the documentation of both an allergy with a reaction and severity.

References

1. Trubiano J, Phillips E. Antimicrobial stewardship's new weapon? A review of antibiotic allergy and pathways to 'de-labeling.' Curr Opin Infect Dis. 2013;26(6).
2. Salkind AR, Cuddy PG, Foxworth JW. The rational clinical examination. Is this patient allergic to penicillin? An evidence-based analysis of the likelihood of penicillin allergy. JAMA. 2001;285(19):2498-2505.
3. Campagna JD, Bond MC, Schabelman E, Hayes, BD. The use of cephalosporins in penicillin-allergic patients: a literature review. J Emerg Med 2012;42:612-20.

AUTHOR DISCLOSURE

Authors of this investigation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of the presentation: Michael Licari, nothing to disclose; Michael Forman, nothing to disclose.

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