Inappropriate Aztreonam Usage Identified as an Opportunity to Reduce Pharmaceutical Expenditures
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BACKGROUND
Targeting “low-hanging fruit” is a pillar of antimicrobial stewardship (AMS). Beta-lactam allergies (BLA) frequently restrict clinical decision-making and lead to utilization of alternative, less preferred antimicrobials making them an ideal AMS target.
Prior studies have demonstrated that BLA are grossly over reported by patients. This study aimed to calculate the excess pharmaceutical expenditures incurred by utilization of aztreonam (AZT) in patients who had previously (or subsequently) tolerated a beta lactam (BL).

METHODS
Retrospective chart review
Inclusion: all inpatients >18 years old at our institution who received at least 1 dose of AZT during the 2017 calendar year.
Exclusion: No documented BLA or if they received aztreonam as targeted/de-escalation therapy.
Data collected: B-lactam allergy, reaction type/date, current indication of aztreonam, prior/subsequent B-lactam class(s) tolerated, cost of aztreonam & alternative agents
Cost of AZT therapy was compared to the cost of alternative BL based on prior/subsequently tolerated classes of BLs. Comparator agents included: piperacillin/tazobactam (penicillin), cefepime (cephalosporin) and meropenem (carbapenem).
Wholesale acquisition costs were used for each agent. Comparator regimens were based on our health system-wide dosing guidelines adjusted for renal function.
Cost-benefit analysis was performed using TreeAge HealthPro 2018.

RESULTS
132 patients were included in this study.
Table 1 shows upper an lower ranges of variables included in the model.
Figure 1 compares the total cost of aztreonam vs comparators (Cost difference: $27,625.59 (p < 0.0001).
Figure 2 shows decision tree with options include; aztreonam, PCN testing or challenging with PCN.
Figure 3 is the one way sensitivity analysis showing PCN testing and challenging are favorable to aztreonam use in patients with low risk possible PCN allergy.

DISCUSSION
Aztreonam is a costly antimicrobial and reliable surrogate for investigating BLA.
This study demonstrated that reduction in aztreonam utilization based on prior tolerance of beta-lactam agents could lead to a meaningful reduction in pharmaceutical expenditures and serve as low-hanging fruit for an antimicrobial stewardship program.
In the study, the cost difference of aztreonam and the potential alternative was $27,625.59 (p-value < 0.0001).
This cost difference does not take into account the cost of additional non-BL agents (such as vancomycin) or associated labs (trough levels) that may have been co-administered in patients receiving aztreonam.
Additionally, we did not account for potential de-escalation which may further reduce costs. Thus the overall cost to the health system is likely underestimated.
The 1-WSA showing PCN testing is favored over direct challenge as PCN test cost decreases. Both are more cost-effective strategies than aztreonam use.

REFERENCES
CDC. Is it Really a Penicillin Allergy? https://www.cdc.gov/antibiotic-use/community/pdfs/penicillin-factsheet.pdf
Smith, BJ et al. Mitigation of inappropriate Aztreonam utilization by preemptive chart review. Poster Presentation. MAD ID Conference. Orlando, FL. May 2018

Table 1: Variable high and low ranges

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Variable Low</th>
<th>Variable High</th>
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<tbody>
<tr>
<td>Probability unfavorable outcome aztreonam</td>
<td>0.07</td>
<td>0.15</td>
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<tr>
<td>Cost aztreonam</td>
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<td>350</td>
</tr>
<tr>
<td>Cost alternative</td>
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<td>150</td>
</tr>
<tr>
<td>Cost minor allergy</td>
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<td>8000</td>
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<tr>
<td>Cost major allergy</td>
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<td>100000</td>
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<tr>
<td>Cost unfavorable outcome</td>
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<td>50000</td>
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<tr>
<td>Probability unfavorable outcome alternative</td>
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<td>0.08</td>
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<tr>
<td>Probability minor allergy</td>
<td>0.01</td>
<td>0.03</td>
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<tr>
<td>Probability major allergy</td>
<td>0.0005</td>
<td>0.0012</td>
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<tr>
<td>Cost PCN test</td>
<td>75</td>
<td>200</td>
</tr>
</tbody>
</table>

Fig 1: Decision tree

Fig 2: One way sensitivity analysis

Fig 3: 1-Way Sensitivity Analysis (1-WSA)