Examining the relationship between patient satisfaction and antibiotic prescribing for acute adult bronchitis in an ambulatory setting

Marie Yasuda, PharmD[1,2], Nina Kim, PharmD[1,2], Leticia Moczygemba, PharmD, PhD[2], Kenneth Lawson, PhD[2], Seth Sullivan, MD[1], Paul Godley, PharmD[1]

[1]*Baylor Scott & White Health, Temple, Texas* [2]*University of Texas at Austin, Austin, Texas*

Background

The Centers for Disease Control and Prevention estimates that at least two million people in the United States gets an antibiotic resistant infection each year[1], resulting in:

- 13.7% of drug-related ED visits[2]
- 23,000 direct deaths[1]
- $20 billion excess costs[1]

Antibiotics are only effective against bacterial infections

Most cases of acute adult bronchitis (AAB) are caused by viruses[3]

Antibiotics are not useful in treating most AAB cases[3]

Antibiotics should be avoided in AAB treatment[3]

And yet… Over 70% of outpatient AAB visits result in an antibiotic[3]

Why do providers continue to give antibiotics for AAB?

- Provider perception of patient expectation may lead to overprescribing[4]
- When interviewed, clinicians cite concerns for low patient satisfaction[5]

Objectives

The objectives of this study are to:

- Examine the relationship between antibiotic prescribing and patient satisfaction
- Identify factors outside of antibiotic prescribing that can significantly impact patient satisfaction

Setting

Baylor Scott & White Health (BSWH) is an integrated delivery network and the largest not-for-profit healthcare system in Texas.

This project was born from the efforts of the BSWH Ambulatory Antibiotic Stewardship Committee to generate evidence-based recommendations to promote antibiotic avoidance and to provide alternative strategies to retain patient satisfaction.

Methods

Study Design

This is a retrospective study utilizing:

1. An Electronic Health Record (EHR) report to identify eligible outpatient AAB visits
2. Visit-specific electronic patient satisfaction survey data

Survey data will be matched to visits using either a unique encounter identifier or a combination of a unique patient identifier + visit date.

Timeframe	January 1, 2017 – August 13, 2018
Inclusion	Outpatient visits with AAB diagnosis codes for adults 18-64 years or age
Exclusion	Must have a 30-day negative medication history for antibiotics, 12-month negative comorbid condition history, and a 38-day negative competing diagnosis history

The presence of multicollinearity will be assessed using variance inflation factors (VIF).

Data Analysis

- Descriptive statistics for all variables
- Logistic regression model for analysis

Primary Outcome – A survey item to measure patient satisfaction:

Using any number from 0 to 10, where 0 is the worst provider possible and 10 is the best provider possible, what number would you use to rate this provider?

The primary outcome will be dichotomized using the Top-Box approach. This approach was selected based on methodology from studies on similar patient satisfaction surveys[7]:

Primary Predictor – Did the patient receive an antibiotic? Used to define cohorts:

Cohort A: Eligible AAB visits that *did* result in an antibiotic prescription

Cohort B: Eligible AAB visits that did *not* result in an antibiotic prescription

Covariates

Patient-level variables

Age Race Smoking status Sex Primary insurance Elixhauser Comorbidity Index

Survey items

CP1	Friendliness/courtesy of the care provider
CP3	Concern the care provider showed for your questions or worries
CP4	Care provider's efforts to include you in decisions about your treatment
CP8	Amount of time the care provider spent with you
CP2	Explanations the care provider gave you about your problem/condition
A14	Ease of getting through to clinic on the phone
V60	Wait time at clinic (from arriving to leaving)
N2	Concern the nurse/assistant showed for your problem
N1	Friendliness/courtesy of the nurse/assistant

Logistic regression model

- Covariates excluded due to large proportion of missing data → Smoking & A14
- Covariates excluded due to multicollinearity after stepwise process → CP1 &CP4
- 88 visits excluded due to missing data across remaining covariates

Table 2. Logistic regression output (*probability modeled is Top-Box*)

Variable	Wald Chi-Square	*p*-value	Adjusted Odds Ratio	95% Confidence Limits
Cohort A (Antibiotic)	0.05	0.831	1.05	(0.67, 1.65)
Cohort B (No antibiotic) ◊	-	-	-	-
Age	2.39	0.122	1.01	(0.99, 1.03)
Sex, Female	4.24	0.040*	0.69	(0.48, 0.98)
Sex, Male◊	-	-	-	-
Race, White◊	-	-	-	-
Race, Black	0.03	0.867	1.04	(0.54, 2.00)
Race, Asian	0.07	0.792	0.98	(0.37, 2.61)
Race, Other	0.22	0.645	1.49	(0.30, 7.34)
Race, Unknown	0.02	0.910	1.06	(0.52, 2.15)
Insurance, Commercial	0.00	0.983	0.13	(0.02, 1.15)
Insurance, Medicare	0.00	0.984	0.15	(0.02, 1.37)
Insurance, Medicaid	0.00	0.993	>999.99	(<0.01, >999.99)
Insurance, Self-pay◊	-	-	-	-
Insurance, Other	0.00	0.993	>999.99	(<0.01, >999.99)
CP3	22.91	<0.001*	3.12	(1.96, 4.97)
CP8	9.21	0.002*	1.92	(1.26, 2.92)
CP2	17.02	<0.001*	2.35	(1.57, 3.53)
V60	34.85	<0.001*	1.86	(1.51, 2.29)
N2	0.02	0.890	0.97	(0.59, 1.57)
N1	5.60	0.018*	1.78	(1.10, 2.86)

* α of 0.05 was used to determine statistical significance ◊ Factor reference category

Results

The EHR report identified 35,561 eligible AAB visits. Of these:

- 7% had matching survey data resulting in a final sample of 2,372 visits (412 visits in Cohort A; 1,960 visits in Cohort B)
- Both Cohort A (antibiotic) and Cohort B (no antibiotic) had the same percentage of top-box responses (89%, *p*-value= 0.962)

Table 1. Descriptive statistics by cohort

Variable	Cohort A (Antibiotic)	Cohort B (No antibiotic)	*p*-value
Total visits – no. (%)	1960 (83)	412 (17)	-
Age - Mean (SD)•	60.4 (13.7)	59.4 (13.8)	0.193
Sex, female – no. (%)†	278 (67.5)	1168 (59.6)	0.003*
Race – no. (%)†			0.419
White	343 (83.3)	1666 (85.0)	
Black	28 (6.8)	120 (6.1)	
Asian	7 (1.7)	46 (2.4)	
Other	9 (2.2)	23 (1.2)	
Unknown	25 (6.1)	105 (5.4)	
Smoking – no. (%)†			0.950
Yes	44 (11)	216 (11)	
Quit	57 (14)	276 (14)	
No data	311 (75)	1468 (75)	
Insurance – no. (%)†			0.269
Commercial	233 (56.6)	1220 (62.2)	
Medicare	170 (41.3)	700 (35.7)	
Medicaid	0 (0)	1 (0.1)	
Self-pay	9 (2.2)	38 (1.9)	
Other	0 (0)	1 (0.1)	
CP1 – Mean (SD), Median‡	4.90 (0.45), 5	4.91 (0.39), 5	0.604
CP3 – Mean (SD), Median‡	4.90 (0.42), 5	4.91 (0.39), 5	0.604
CP4 – Mean (SD), Median‡	4.86 (0.46), 5	4.86 (0.49), 5	0.673
CP8 – Mean (SD), Median‡	4.82 (0.50), 5	4.82 (0.50), 5	0.496
CP2 – Mean (SD), Median‡	4.82 (0.51), 5	4.85 (0.50), 5	0.049*
A14 – Mean (SD), Median‡	4.46 (0.86), 5	4.47 (0.82), 5	0.824
V60 – Mean (SD), Median‡	4.58 (0.72), 5	4.58 (0.75), 5	0.927
N2 – Mean (SD), Median‡	4.77 (0.51), 5	4.74 (0.55), 5	0.325
N1 – Mean (SD), Median‡	4.82 (0.47), 5	4.82 (0.46), 5	0.925

* α of 0.05 was used to determine statistical significance
• T-tests were run for continuous variables
† Chi Square tests were run for nominal variables
‡ Mann-Whitney U tests were run for ordinal variables

Conclusions

Logistic regression shows that the odds of being classified as top-box are:

- **Not significantly affected by receipt of an antibiotic**
- **Significantly impacted by factors outside of antibiotic prescribing**
  - Three of these factors are related to the care provider:
    - 212% higher odds for each unit increase in CP3
    - 92% higher odds for every unit increase in CP8
    - 135% higher odds for every unit increase in CP2
  - Factors are outside of the care provider's direct control:
    - 86% higher odds for every unit increase in V60
    - 78% higher odds for every unit increase in N1
    - 39% lower odds when the patient is female vs. male

Rather than prescribing antibiotics, care providers may better impact patient satisfaction ratings through attitude (showing concern), time (spend with the patient) and explanations (about the diagnosis).

Limitations

- This is a single-system study, limiting the generalizability of results
- While the original EHR report identified a substantial number of visits, the survey match rate was low, decreasing our final sample size considerably
- Comparing the cohorts (*Table 1*) reveals that a disproportionate (83%) number of visits resulted in an antibiotic prescription, and that the proportion of gender and the distribution of responses to CP2 were significantly different. However, these were adjusted for in our analysis through the logistic regression model
- The distribution of responses to the primary predictor were skewed (89% rated 9/10) which may impact our ability to detect a difference between cohorts

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