Low-Value Antibiotic Prescribing and Clinical Factors Influencing Patient Satisfaction

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ABSTRACT

OBJECTIVES: Patient-centered healthcare is a high priority and is commonly measured and incentivized through patient satisfaction surveys. There is a need to further understand if increasing satisfaction has the unintended consequence of encouraging low-value care. This study assessed the association of low-value antibiotic prescribing with patient satisfaction scores, and it evaluated patient and provider characteristics that may impact the association.

STUDY DESIGN: Retrospective, observational study of acute sinusitis (AS) encounters for adult members of a large integrated delivery system from 2010 to 2013.

METHODS: Bivariate and multivariate analyses evaluating the use of antibiotics, patient attributes, and provider characteristics associated with favorable patient satisfaction scores.

RESULTS: Among 5169 encounters for AS, 79.5% of encounters in which antibiotics were prescribed had favorable satisfaction scores versus 75.4% of encounters in which they were not. Independent predictors of favorable satisfaction scores included: receipt of antibiotics (adjusted odds ratio [aOR], 1.24; 95% CI, 1.00-1.55), 45 years or older (aOR, 1.45; 95% CI, 1.24-1.69), Elixhauser Comorbidity Index score 2 or greater (aOR, 1.21; 95% CI, 1.05-1.40), provider business partner status (aOR, 1.38; 95% CI, 1.20-1.58), and a bonded encounter between a patient and their assigned primary care physician (aOR, 2.06; 95% CI, 1.75-2.44).

CONCLUSIONS: Patient satisfaction scores are slightly lower when antibiotics are *not* prescribed for AS, but 75% of those encounters still received favorable satisfaction scores. Factors such as older patient age, more comorbidities, and an established patient–provider relationship had stronger associations with high patient satisfaction.

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In recent years, patient satisfaction has been recognized as a key measure of the quality of healthcare delivery in the United States. In an effort to encourage a greater focus on patient satisfaction, hospitals and providers have been given financial incentives to measure and improve these scores, especially relative to their peers.[1,2] Although some reports have shown a favorable relationship between high satisfaction scores and other dimensions of quality,[3-6] others suggest that the emphasis on higher scores may promote job dissatisfaction among providers[7] or increase potentially harmful low-value care.[8-10] This conflicting evidence makes it difficult to know if efforts to improve patient satisfaction scores facilitate or hinder a health system's ability to provide high-quality healthcare in other respects.[11]

Another important, and seemingly unrelated issue, is antibiotic stewardship. Prescribing antibiotics for common viral illnesses is widely prevalent but unnecessary, costly, and potentially harmful.[12,13] Acute sinusitis (AS), which affects 30 million Americans annually,[14] is an example of a common condition for which low-value antibiotics are too often prescribed. US and European studies have all reported high rates (81%-85%) of antibiotic use for AS,[15-17] and in the participating study sites for the current study, the reported prescription rates were as high as 90%. With the majority of these prescriptions being contrary to current recommendations,[18] these prescriptions are likely to cause more harm than benefit.[19] This low-value prescribing for AS has become such a concern that it is targeted by 5 national provider organizations as part of the Choosing Wisely campaign.[18]

Patient satisfaction is one reason for prescribing low-value antibiotics. Some providers believe that their patients expect to receive prescriptions for antibiotics[20] and, in addition, that high patient satisfaction scores depend upon the receipt of such prescriptions.[7] Although there has been some research on the relationship between the receipt of antibiotics and patient satisfaction scores, there is insufficient information to draw conclusions about the impact.[21,22] Understanding the patient and provider characteristics that influence the relationship between low-value care and patient

TAKEAWAY POINTS

We assessed the effect of low-value antibiotic prescribing on patient satisfaction scores, as well as the impact of patient and provider characteristics on favorable scores.

- Patient satisfaction is slightly higher when low-value antibiotics are prescribed.
- A total of 75.4% of encounters not resulting in prescriptions of low-value antibiotics still received favorable satisfaction scores.
- Encounter factors such as an established patient-provider relationship, older patient age, and more chronic conditions each favorably influence patient satisfaction scores.
- Future research and policies should account for these influential variables when studying or comparing patient satisfaction.

satisfaction will inform interventions and policies to promote high-quality care.

The primary aim of this study was to assess the effect of low-value antibiotic prescribing on patient satisfaction scores. The secondary aims were to evaluate patient and provider characteristics that may confound or modify the association between receipt of low-value care and satisfaction scores.

METHODS

Design

This is a retrospective, observational study of AS encounters (*International Classification of Diseases, Ninth Revision, Clinical Modification* [*ICD-9-CM*] code 461.x) from 2010 to 2013 within Kaiser Permanente Southern California, a large integrated delivery system that provides care for approximately 4 million members of a prepaid health plan.

Participants

The primary inclusion criterion was adults diagnosed with AS. To limit our sample to those with uncomplicated AS, who are least likely to warrant antibiotics, we excluded encounters resulting in hospital admission, follow-up encounters, and encounters for immunocompromised patients. A follow-up AS encounter was defined as a visit for a patient who had already had a visit for AS in the 30 days before the index visit. Follow-up visits were excluded as they are more likely to warrant an antibiotic prescription based on current recommendations.[14,18,19] "Immunocompromised" was defined as the presence of a diagnostic code for any of the following in the 12 months prior to the encounter: chronic liver disease (*ICD-9-CM* code 571), end-stage renal disease (*ICD-9-CM* code 585.6), congestive heart failure (*ICD-9-CM* code 428), immune disorders (*ICD-9-CM* code 279), malignant neoplasms (*ICD-9-CM* codes 140-165, 170-176, 179-209, and 235-239), and common rheumatologic disorders frequently treated with immune-suppressing medications (*ICD-9-CM* codes 714, 710, 555.9, and 556), as described in prior studies.[18] The sample for analysis included eligible patients with uncomplicated AS who completed a patient satisfaction survey.

We included the following patient-level characteristics in our analysis: age, sex, race, and Elixhauser Comorbidity Index (ECI) score. The ECI is a validated tool, similar to the Charlson Comorbidity Index, designed to adjust for differences in patient outcomes that are explained by variations among chronic patient conditions.[23-25] Provider characteristics included age, sex, partner status (associate vs business partner), race, years of experience, and patient–provider bonded status. The patient–provider bonded status variable indicates if the encounter occurred between a patient and their assigned primary care provider. Nonbonded visits comprised many encounter types, including urgent care visits (28%) and emergency department or specialty care visits (7%), but most were with another primary care provider (65%) who may have been covering for the assigned bonded provider. For these reasons, we consider the bonded status a reasonable surrogate marker for an established patient-doctor relationship.

Main Measures

We identified our primary outcome by using results from a routine, randomized, postvisit, member satisfaction survey. The primary outcome for analysis was receipt of an overall patient satisfaction score of 9 or greater (out of a possible 10), and the main independent variable of interest was an antibiotic prescription after an AS encounter. The survey was sent at random to members following approximately 15% of outpatient visits, and it had an overall response rate of 18%. Although this response rate is not as high as recommended in primary survey research, it represents pragmatic, real-world results reflective of the patients who respond to current satisfaction surveys used to evaluate providers and health systems in the United States. The satisfaction outcome we used for our analysis was the combined mean score derived from 10 questions asked that were related to visit satisfaction. Questions were scored on a 10-point scale ranging from very dissatisfied (1) to very satisfied (10). We set the "favorable" mean satisfaction score of 9 or greater as the cut point because in our system, providers receive a small financial incentive added monthly to their base pay for scores of 9 or higher. Beyond financial compensation, mean satisfaction scores are also used for credentialing purposes and to assess a physician's eligibility to be promoted from an associate physician to a partner in the Southern California Permanente Medical Group.

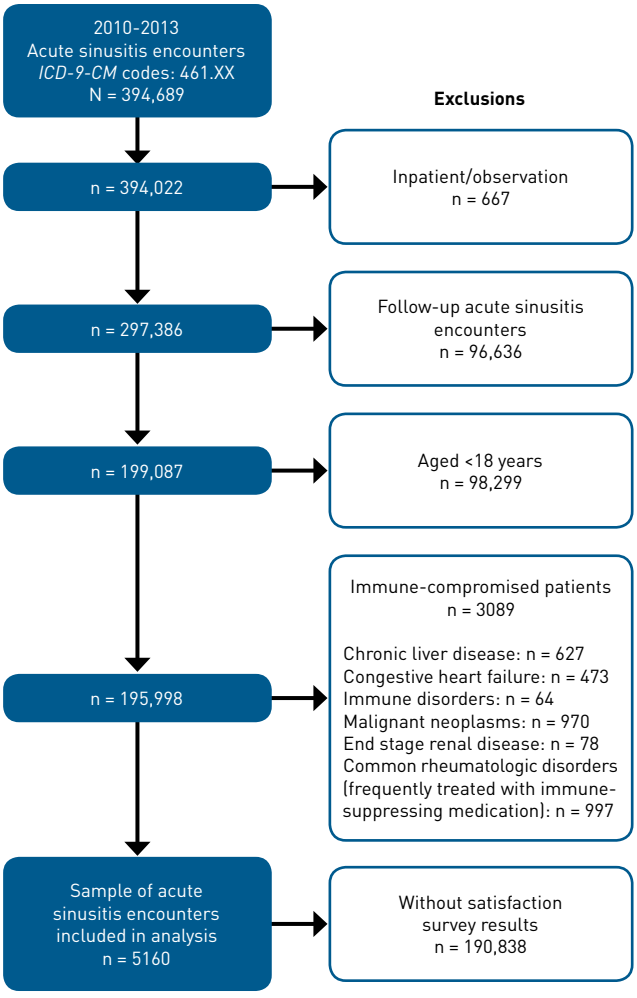
We used hierarchical logistic regression to examine patient and provider factors that were associated with an overall patient satisfaction score of 9 or greater. This allowed us to account for clustering of patients within a provider's patient panel. First, we performed model selection to identify patient and provider factors

that were associated with a patient satisfaction score of 9 or greater in models that included a variable indicating if antibiotics were prescribed. Variables for which *P* values were less than a 0.2 level of significance in the first step were advanced to the model selection procedure. Second, antibiotic receipt was included in all logistic regression models, and other variables were then included individually to assess whether receipt of antibiotics remained associated with favorable satisfaction scores, independent of each variable. Variables were included in the final adjusted model if they met one of the following criteria: 1) the *P* value for antibiotics receipt crossed the .05 level of significance (in either direction) after including it in the model or 2) a statistically significant interaction occurred between the variable and the receipt of antibiotics (Likelihood Ratio Test $P < .05$). A final adjusted model, including receipt of antibiotics and the variables or interactions meeting any of the 3 aforementioned criteria, was used to summarize the adjusted relationship between receipt of antibiotics and patient satisfaction scores. Where necessary, we adjusted for multiple comparisons using a Bonferroni correction.

Patient age was dichotomized as being above or below the 25th percentile (45 years), as comparisons of satisfaction scores revealed that while patients in the 50th and 75th percentile age groups had significantly higher scores than those below the 25th percentile, the former 2 did not score providers significantly differently. For similar reasons, we dichotomized the ECI at the 75th percentile (≥2 comorbidities).

Additionally, we tested an antibiotics-by-bonded-status interaction to assess whether the effect of prescribing differed for patients evaluated by their primary care provider versus another physician and adjusted the stratum-specific odds ratios (ORs) and 95% CIs as appropriate.[26] We also performed a sensitivity analysis to identify factors that appeared to be unbalanced (assessed via crude standardized differences and *P* values) between antibiotic groups. In addition to the primary outcome of overall patient satisfaction, we performed adjusted sensitivity analyses to assess individual responses to satisfaction questions specific to individual components of the encounter, such as satisfaction with the provider and assessment of the provider's abilities. All statistical analyses were performed with SAS version 9.3 (SAS Institute Inc; Cary, North Carolina).

FIGURE. Flow Diagram Illustrating the Overall Sample Cohort Used for Analysis



ICD-9-CM indicates *International Classification of Diseases, Ninth Revision, Clinical Modification.*

RESULTS

The study sample included 5169 encounters for AS with a completed satisfaction survey from 2010 to 2013 (**Figure**). Patients had a mean age of 54.9 years, 68.0% were female, 58.4% were white, and the mean ECI score was 1.6. Among providers, 45.6% were female, 53.7% were partners, and 87.5% had more than 3 years' postresidency experience. Overall, 79.1% of encounters resulted in a favorable satisfaction score: 79.5% of those receiving antibiotics and 75.4% of those who did not (**Table 1**).

Unadjusted results showed that prescribing antibiotics increased the odds of receiving favorable satisfaction scores (OR, 1.27; 95% CI, 1.02-1.58). Other variables predicting higher satisfaction scores were patient 45 years or older (OR, 1.58; 95% CI, 1.36-1.83), ECI score of 2 or greater (OR, 1.36; 95% CI, 1.19-1.57), and provider partner status (OR, 1.41; 95% CI, 1.23-1.61). The largest effect was from bonded encounters in which an established patient–provider relationship existed (OR, 2.06; 95% CI, 1.75-2.44). Patient sex (OR, 0.94; 95% CI, 0.81-1.08), white patient race (OR, 1.096; 95% CI, 0.96-1.26), and provider sex (OR, 0.98; 95% CI, 0.85-1.12) were not associated with higher satisfaction scores (**Table 2**).

In the multivariable analysis, receipt of antibiotics narrowly maintained statistical significance (OR, 1.24; 95% CI, 1.00-1.55)

TABLE 1. A Description of Patient Satisfaction Scores Stratified by Patient and Provider Characteristics[a]

Encounter Characteristics	Unfavorable Satisfaction Score <9		Favorable Satisfaction Score ≥9		Total
	n	%	n	%	N
Patient–provider not bonded	863	24.3%	2694	75.7%	3557
No antibiotics	89	27.1%	239	72.9%	328
Antibiotics	774	24.0%	2455	76.0%	3229
Patient–provider bonded[b]	214	13.3%	1389	86.7%	1603
No antibiotics	29	19.1%	123	80.9%	152
Antibiotics	185	12.7%	1266	87.3%	1451
Patient age ≥45 years	734	18.9%	3149	81.1%	3883
No antibiotics	76	22.2%	266	77.8%	342
Antibiotics	658	18.6%	2883	81.4%	3541
Patient age <45 years	343	26.9%	934	73.1%	1277
No antibiotics	42	30.4%	96	69.6%	138
Antibiotics	301	26.4%	838	73.6%	1139
Provider is a business partner	506	18.3%	2266	81.7%	2772
No antibiotics	50	18.5%	221	81.5%	271
Antibiotics	456	18.2%	2045	81.8%	2501
Provider is not a business partner	571	23.9%	1817	76.1%	2388
No antibiotics	68	32.5%	141	67.5%	209
Antibiotics	503	23.1%	1676	76.9%	2179
ECI mean score <2	692	23.0%	2322	77.0%	3014
No antibiotics	78	25.2%	232	74.8%	310
Antibiotics	614	22.7%	2090	77.3%	2704
ECI mean score ≥2	385	17.9%	1761	82.1%	2146
No antibiotics	40	23.5%	130	76.5%	170
Antibiotics	345	17.5%	1631	82.5%	1976
Overall	1077	20.9%	4083	79.1%	5160
No antibiotics	118	24.6%	362	75.4%	480
Antibiotics	959	20.5%	3721	79.5%	4680

ECI indicates Elixhauser Comorbidity Index.
[a]A description of the acute sinusitis encounter characteristics in our overall sample from 2010 to 2013. The table includes those variables used in our final model, stratified by encounters resulting in a favorable (≥9) and unfavorable (<9) mean satisfaction score.
[b]Patient–provider bonded encounters were those between a patient and their assigned primary care physician.

and other variables remained significantly correlated with high satisfaction scores: patient 45 years or older (OR, 1.45; 95% CI, 1.24-1.69), ECI score 2 or greater (OR, 1.21; 95% CI, 1.05-1.40), and provider partner status (OR, 1.38; 95% CI, 1.20-1.58). There was a statistically significant interaction between receipt of antibiotics and bonded status (**Table 3**). Adjusted results—using, as the comparison group, nonbonded encounters in which antibiotics were not prescribed—showed that bonded encounters in which antibiotics were prescribed had the highest odds of receiving favorable satisfaction scores (OR, 2.33; 95% CI, 1.56-3.47). Nonbonded encounters in which antibiotics were prescribed (OR, 1.15; 95% CI, 0.81-1.63) and bonded encounters in which antibiotics were not prescribed (OR, 1.47; 95% CI, 0.77-2.78) were not significantly different from one another. In a sensitivity analysis stratified by patient–provider bonded status, and adjusting the confidence limits for multiple comparisons, we found no significant antibiotic impact on favorable satisfaction scores for bonded encounters (OR, 1.59; 95% CI, 0.89-2.85) or nonbonded encounters (OR, 1.15; 95% CI, 0.81-1.63).

DISCUSSION

In this large observational study, we found that prescribing low-value antibiotics increased the odds of a favorable satisfaction score. However, the vast majority of encounters in which antibiotics were not prescribed still resulted in high satisfaction (75.4%), marking only about a 4 percentage-point difference from those in which antibiotics were prescribed (79.5%). The factor with the largest effect on satisfaction was an established patient–doctor relationship; encounters with older patients and those with more chronic conditions were also more likely to result in favorable satisfaction scores.

These results have particular implications for current policies and practices using satisfaction scores to evaluate system and provider performance. The patient and provider characteristics found to be associated with higher patient satisfaction may help explain the contradictory results of different studies, some linking higher quality to higher satisfaction,[3-6] others showing the correlation of adverse outcomes with higher satisfaction.[7-10] Future research should attempt to adjust for patient age and comorbidities, as well as an established patient–provider relationship.

Providers should focus on the fact that most encounters not receiving antibiotics still had high overall satisfaction scores, not on the small 4 percentage-point absolute difference (Table 1). We predict most providers would not want to prescribe low-value antibiotics to 25 individuals in order to possibly receive a small benefit in 1 satisfaction score. Our results are also particularly useful in understanding how an established patient–provider relationship may play the largest role in contributing to high patient satisfaction scores. This has implications for acute care providers in urgent care and emergency department settings; they should not expect to have satisfaction results similar to those generated by similar encounters between a patient and their primary care provider. An overemphasis on patient satisfaction scores for providers without an established relationship with patients may exacerbate the provision of low-value care or contribute to provider dissatisfaction with

existing measures of patient satisfaction. This evidence suggests a need to consider varying patient demographics and variations in established patient–provider relationships to appropriately compare satisfaction scores among different clinical settings.

Limitations and Strengths

We recognize the limitations of a retrospective observational study and the possibility that unmeasured confounders might have influenced patient satisfaction. However, we made every effort to control for measurable patient and provider factors influencing satisfaction, beyond those published in previous studies. Also, the physicians in our study are all part of a large prepaid multispecialty medical group and integrated delivery system; therefore, the generalizability of these results may be limited. We were able to identify factors associated with patient satisfaction, but cannot determine if these factors are causal or the putative mechanism of causality. There may also be other potentially important patient factors (eg, socioeconomic status or mental health disorders) that influence patient satisfaction, which we could not measure. Nonresponder bias in our surveys is a consideration, and it is possible that patients seen during a bonded patient–provider encounter might have been more or less likely to complete the survey. However, the survey methods used in our system are similar to those used by others per Medicare requirements. Our study sample of encounters returning satisfaction surveys had similar patient characteristics to our previously published study of all initial AS encounters,[18] and our results are representative of current, real-world satisfaction survey reports, which is a more important indicator of the results US physicians and health systems should expect. Also, all surveys are strictly confidential; consequently, patients should not have been concerned that their responses would be seen by their physicians. Additionally, all our encounters use electronic health record documentation and although this has been reported to affect patient satisfaction scores in other settings, a previous analysis showed that using computers in the exam rooms did not impact patient satisfaction scores in our system.[27]

An important strength of this large observational study is that we were able to examine satisfaction scores at the encounter level, specifically with respect to whether a patient received antibiotics or not. This contrasts with many prior studies in which the satisfaction of patients was studied at an aggregate level.[4,6,8,28,29]

We hope that our findings will not encourage unwarranted antibiotic prescribing, or any other low-value medical services, in order to bolster patient satisfaction scores. Our results are intended to inform future research and policies, and they are similar to recent facility-level comparisons in the United Kingdom, which concluded that patients are more satisfied when they receive antibiotics.[30] These findings highlight the importance of measuring, reporting, and incentivizing providers based on quality metrics beyond patient satisfaction. However, the absolute effect is small

TABLE 2. Simple Comparisons of Factors Possibly Influencing Patient Satisfaction[a,b]

	OR	95% CI
Provider prescribed antibiotics	**1.27**	**1.02-1.58**
Patient age (≥45 years)	**1.58**	**1.36-1.83**
Male patient	0.94	0.81-1.08
White patient race	1.10	0.96-1.26
ECI score ≥2	**1.36**	**1.19-1.57**
Provider is a business partner	1.41	1.23-1.61
Male provider	0.98	0.85-1.12
Provider age (≥45 years)	1.03	0.90-1.18
White provider race	1.046	0.91-1.20
Primary care provider	1.00	0.84-1.18
Provider experience (≥3 years)	1.09	0.86-1.37
Patient–provider bonded[c]	**2.06**	**1.75-2.44**

CI indicates confidence interval; ECI, Elixhauser Comorbidity Index; OR, odds ratio.
[a]Unadjusted comparisons of the impact of different patient and provider variables on the odds of receiving a favorable (≥9) overall patient satisfaction score after an acute sinusitis encounter.
[b]Bolded numbers indicate those factors found to be statistically significant.
[c]Patient–provider bonded encounters were those between a patient and their assigned primary care physician.

TABLE 3. Adjusted Results of Factors Possibly Influencing Patient Satisfaction[a,b]

	OR	95% CI
Antibiotics prescribed	**1.24**	**1.00-1.55**
Patient age (>45 years)	**1.45**	**1.24-1.69**
ECI (score ≥2)	**1.21**	**1.05-1.40**
Business partner	**1.38**	**1.20-1.58**
Bonded encounter	**1.95**	**1.63-2.33**
Antibiotics-by-bonded interaction		
(ref = nonbonded/no antibiotics)		
Nonbonded with antibiotics	1.15	0.81-1.63
Bonded no antibiotics	1.47	0.77-2.78
Bonded with antibiotics	**2.33**	**1.56-3.47**
(within bonded comparisons)		
Bonded (antibiotics vs none)	1.59	0.89-2.85
Nonbonded (antibiotics vs none)	1.15	0.81-1.63

CI indicates confidence interval; ECI, Elixhauser Comorbidity Index; OR, odds ratio.
[a]The model was adjusted for patient and provider characteristics found significant in bivariate comparisons. Adjusted comparison of the variables leading to a favorable overall patient satisfaction score (≥9) after an acute sinusitis encounter. Heterogeneity in treatment effect is shown via the interaction with antibiotic prescribing and bonded encounters between a patient and their assigned primary care physician.
[b]Bolded numbers indicate those factors found to be statistically significant.

and achieving high patient satisfaction is a complex issue that should not trump sound medical care and quality.[31]

CONCLUSIONS

Our findings indicate that patient satisfaction scores are slightly lower when antibiotics are not prescribed for some encounters. However, the minimal overall impact may help to assure providers that prescribing unwarranted antibiotics is not required to receive high satisfaction scores, as most (75.4%) AS encounters not receiving antibiotics still resulted in favorable satisfaction scores (vs 79.5%). Additionally, an established patient–provider relationship and encounters with older patients with more comorbidities are more likely to be correlated with high satisfaction scores for acute encounters. These characteristics should be included in future satisfaction research and hospital/provider comparisons. The correlation between low-value care and higher satisfaction should encourage policies to evaluate and incentivize providers not only for high patient satisfaction, but for other important metrics of quality as well. ■

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