Mark Ashworth, Patrick White, Hannah Jongsma, Peter Schofield and David Armstrong

Antibiotic prescribing and patient satisfaction in primary care in England:

cross-sectional analysis of national patient survey data and prescribing data

Abstract

Background
Concerns about adverse effects on patient satisfaction may be an important obstacle to attempts to curtail antibiotic prescribing.

Aim
To determine the relationship between antibiotic prescribing in general practice and reported patient satisfaction.

Design and setting
Retrospective cross-sectional study of general practices in England.

Method
Data were obtained from the General Practice Patient Survey (GPPS) in 2012 (2.7 million questionnaires in England; 982 999 responses; response rate 36%); the national Quality and Outcomes Framework dataset for England, 2011–2012 (8164 general practices); and general practice and demographic characteristics. Standardised measures of antibiotic prescribing volumes were obtained for each practice in England during 2012–2013, together with 12 other nationally available prescribing variables. The role of antibiotic prescribing volume was identified as a determinant of GPPS scores and adjusted for demographic and practice factors using multiple linear regression.

Results
The final dataset consisted of 7800 (95.5%) practices. A total of 33.7 million antibiotic prescriptions were issued to a registered population of 53.8 million patients. Antibiotic prescribing volume was a significant positive predictor of all 'doctor satisfaction' and 'practice satisfaction' scores in the GPPS, and was the strongest predictor of overall satisfaction out of 13 prescribing variables. A theoretical 25% reduction in antibiotic prescribing volume would be associated with 0.5–1.0% lower patient satisfaction scores, a drop of 3–6 centile points in national satisfaction ranking.

Conclusion
Patients were less satisfied in practices with frugal antibiotic prescribing. A cautious approach to antibiotic prescribing may require a trade-off in terms of patient satisfaction.

Keywords
antibiotic prescribing; antibiotics; patient experience; patient satisfaction; primary health care.

INTRODUCTION

The cornerstone of good general practice has long been recognised as lying in the quality of the relationship between doctor and patient. This focus on the interaction between GP and patient has been further reinforced in recent years by increasing attention on the patient's experience of healthcare encounters. Measures of this aspect of general practice activity have been elicited through patient surveys that invite patients to report on the care they have experienced from their local practice. This process has been formalised since 2007 in the annual General Practice Patient Survey (GPPS), which invites a representative sample of around 2.7 million adults registered with GPs in England to comment on the quality of their care.[1] Not only does this survey provide feedback from patients to their GPs, but it has also been a component of the pay-for-performance Quality and Outcomes Framework and is currently monitored by commissioners and inspectors of primary care. GPs are incentivised to make the experience of care a good one.

However, pleasing the patient is not always consistent with providing good-quality care. GPs are well aware that patients may demand an antibiotic when it is not judged clinically appropriate. Sometimes it is the GP's perception of that demand that seems important.[2] In a survey of GPs by the organisers of the Longitude Prize (a national science prize in which the public voted for the most pressing issue facing humanity), 55% reported pressure to prescribe antibiotics, 45% had prescribed antibiotics for a viral infection knowing that they would be ineffective, and 44% admitted that they had prescribed antibiotics in order to get a patient to leave the consulting room.[3] Spending more time with patients has been reported to result in fewer antibiotic prescriptions.[4]

Given the growing dangers from antibiotic-resistant bacteria,[5] there have been many attempts to limit antibiotic prescribing in general practice. Following a national campaign in the late 1990s, GP antibiotic prescribing volumes declined by 21.7% from their peak in 1995.[6] Since then, antibiotic prescribing has gradually increased with an overall 6% increase from 2010 to 2013.[7] That there is scope for further reduction is suggested by evidence that many upper respiratory tract infections of a mainly viral origin continue to be treated with antibiotics, with one study reporting antibiotic prescriptions issued for 51% of patients presenting with coughs and colds.[8]

There may be a trade-off between the wish to nurture the doctor–patient relationship and antibiotic stewardship.[4] This trade-off may be an important obstacle to the appropriate limitation of antibiotic prescribing, especially in the context of growing concerns about antibiotic

M Ashworth, DM, MRCP, FRCGP, reader in primary care; **P White**, MRCP, FRCGP, MD, clinical senior lecturer; **H Jongsma**, MSc, MPH student; **P Schofield**, PhD, research fellow; **D Armstrong**, MSc, PhD, FRCGP, FFPH, professor of medicine and sociology, Department of Primary Care and Public Health Sciences, King's College London, UK.

Address for correspondence
Mark Ashworth, Department of Primary Care and Public Health Sciences, King's College London School of Medicine, Guy's Campus, London SE1 1UL, UK.

E-mail: mark.ashworth@kcl.ac.uk

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How this fits in

This is the first study linking national patient experience survey data with prescribing patterns in primary care. The findings demonstrate that patients report lower levels of satisfaction if they are registered at practices that prescribe fewer antibiotics. Although observational studies cannot prove a causal relationship, these findings are consistent with other studies and suggest that frugal antibiotic prescribing is associated with modest reductions in patient satisfaction. GPs who wish to play their part in addressing issues of antibiotic resistance will need to consider alternatives to an antibiotic prescription that do not compromise patient satisfaction.

resistance. Therefore, this study aimed to use the findings of the GPPS to determine whether there was an association between antibiotic prescribing and patient satisfaction in primary care. In particular, it aimed to determine whether patients registered at practices that prescribed fewer antibiotics reported lower levels of overall patient satisfaction.

METHOD

Study design

A retrospective cross-sectional study was conducted using practice-level data from primary care databases. Regression models were constructed to identify the role of antibiotic prescribing as a determinant of patient experience (as elicited by the GPPS), adjusted for practice, structural, and demographic characteristics.

Antibiotic prescribing data

Antibiotic prescribing volumes were obtained for each practice in England during 2012–2013.[9] The data were standardised such that differences in antibiotic script dose and duration were accounted for by using Average Daily Quantities (ADQs),[10] and differences in the age/sex and temporary resident profile of the registered list of patients were also accounted for by using Specific Therapeutic group Age–sex Related Prescribing Units (STAR-PUs).[11] The resultant measure, ADQ per STAR-PU, approximates to the number of days of antibiotic prescription at the usual prescribed dosage, which are given to a population-standardised 'average' patient registered at each practice.

General Practice Patient Survey

Unweighted GPPS data were obtained for the 2012 calendar year.[12] During 2012, 2.7 million questionnaires were distributed, with an overall response rate of 36% (982 999 completed responses). Each year, the distribution of GPPS follows a similar pattern: questionnaires are sent to a random sample of adult patients registered with GPs in England; approximately one-half are sent in January and one-half in July, with follow-up questionnaires sent to non-responders in the subsequent 2 months. Purposive sampling compensates for lower response rates in some age, sex, practice, deprivation, and ethnicity cohorts.[13]

The 2012 GPPS version contained 41 questions eliciting patient experience relating to primary care, broadly covering the following domains: access, experience of GP care, experience of nurse care, out-of-hours care, and overall satisfaction. The focus of this study was on responses to the six GPPS questions in the 'doctor care domain' (Q21a–e, Q22) and to the two satisfaction questions: 'overall satisfaction' (Q28) and 'recommending to someone else' (Q29). Most questions eliciting patient experience offered five response options (such as 'very good', 'good', 'average', 'poor', and 'very poor'). For the principal analysis, the two most positive response options (for example, 'very good' and 'good') were selected for each question as a percentage of all responses.

Practice data

Descriptive data were obtained for all general practices in England from the general medical services database, based on practice data obtained on 31 March 2012.[9] Eight variables known to be related to patient satisfaction were obtained for inclusion in the regression models:[14] registered patient list size, age and sex profile of registered patients, number of full-time equivalent GPs in each practice, the age and sex of GPs in each practice, the proportion of GPs who were non-UK qualified, and training practice status for the year 2011–2012.

Practice-level ethnicity and deprivation data for all registered patients are not available in England; therefore aggregate demographic data were used based on deprivation and ethnicity census data collated at lower layer super output area level for the practice postcode. Data were based on the 2011 national census and Index of Multiple Deprivation, IMD-2010.[15,16] Three variables were obtained for inclusion in the regression models: social deprivation and the proportions of the local African Caribbean and South Asian populations.

Participants

A previously described method was used[14] to match practice data (n = 8164 practices) with GPPS data (n = 8140 practices), and to exclude atypical practices with <750 patients or <500 patients per full-time equivalent GP. The initial selection consisted of 7959 practices (97.8% of all those submitting data in 2011–2012).

Analysis

A multivariable analysis was conducted to determine the relationship between patient experience factors and overall antibiotic prescribing volumes adjusted for practice and demographic factors. Separate regression models were constructed for the eight GPPS questions included in the study. GPPS scores were entered into each model as the outcome (dependent) variable.

Antibiotic prescribing volumes were entered into the regression models as one of the predictor variables. Eleven additional variables (eight demographic and three practice descriptors, as above) were tested in each model. Multicollinearity was tested for by calculating the variance inflation factor and excluding variables with variance inflation factor >10. To allow for the potential effects of multiple testing, predictor variables were only considered significant if P<0.01. The reported value for each regression model was the unstandardised B coefficient for each predictor variable. The analysis was conducted using SPSS (version 22).

Comparison with other prescribing indicators

To determine whether the volume of antibiotic prescribing was acting as a proxy for other prescribing variables, the analysis was repeated by collecting all other nationally available prescribing variables (n = 13, in addition to the antibiotic variable) and comparing the predictive power of each by adding them to the regression model for 'overall satisfaction' (Q28), as above. The prescribing variables were: net ingredient cost per 1000 registered patients (a measure of total prescribing cost for each practice); standardised volume of antidepressant hypnotic and antipsychotics prescribing (ADQ per STAR-PU); low-cost statins as a proportion of all statins; ezetimibe as a proportion of all lipid-lowering drugs; cephalosporins and quinolones as a proportion of all antibiotics; oral non-steroidal anti-inflammatory drugs (NSAIDs) per STAR-PU; ibuprofen and naproxen as a proportion of all NSAIDs; diclofenac and cyclo-oxygenase-2 (COX-2) inhibitors as a proportion of all NSAIDs; volume of antisecretory drugs and mucosal protectants per STAR-PU; inhaled corticosteroids per STAR-PU; and long- and intermediate-acting insulin analogues as a proportion of all insulins.[9]

The standardised regression coefficient, β, was used in order to test the additional prescribing indicators in the regression model. Standardised β regression coefficients were used in preference to unstandardised B coefficients, because many of the prescribing variables had differing unit denominators, making between-variable comparisons difficult to interpret. First, the β value was demonstrated for antibiotic prescribing volume as a predictor of overall satisfaction; second, the remaining prescribing indicators were added to the regression model and the β value of the additional prescribing indicators was compared with the value for antibiotic prescribing alone. Many of the prescribing variables were closely correlated with each other; therefore each regression model was restricted to a maximum of two prescribing variables (the antibiotic variable plus one of the other variables). Finally, the r^2 value was derived to determine whether additional prescribing indicators strengthened the predictive power of the model. Since multiple testing was being conducted, the sensitivity analysis was confined to just one of the 'doctor domain' questions, 'overall satisfaction' (Q28).

RESULTS

Antibiotic prescribing volumes

The distribution of antibiotic prescribing volumes was skewed with several outliers. By omitting practices with the highest and lowest 1% of antibiotic prescribing volumes (n = 159), the distribution of antibiotic prescribing was normalised. All further analyses were conducted on this sample of 7800 practices (95.5% of all practices in England).

A total of 33 702 980 antibiotic prescriptions were issued to a registered population of 53 812 820. When both the volume of antibiotic prescribing and the registered population were standardised, the mean volume of antibiotic prescribing was 1.15 ADQs per antibiotic STAR-PU; with a standard deviation of 0.26 (Table 1). The mean number of antibiotic STAR-PUs per registered patient per practice was 2.15.

Predictors of positive patient experience scores

Positive responses to all GPPS questions

Table 1. Frequency distribution of antibiotic prescribing volume and patient experience scores in English general practices (*n* = 7800)

Variable[a]	Mean value (standard deviation)	Interquartile range
Antibiotic prescribing volume, ADQ per STAR-PU	1.15 (0.26)	0.98–1.30
Q21a: Rating of GP giving you enough time, %	88.0 (6.33)	84.7–92.6
Q21b: Rating of GP listening to you, %	88.9 (6.30)	85.7–93.4
Q21c: Rating of GP explaining tests and treatments, %	84.8 (6.84)	81.0–89.7
Q21d: Rating of GP involving you in decisions about your care, %	77.9 (7.83)	73.2–83.3
Q21e: Rating of GP treating you with care and concern, %	85.2 (7.32)	81.3–90.4
Q22: Confidence and trust in GP, %	93.7 (4.19)	91.7–96.7
Q28: Overall experience of GP surgery, %	89.5 (7.05)	86.1–94.6
Q29: Recommending GP surgery to someone else, %	81.9 (10.70)	76.1–89.9

[a]Questionnaire numbers as they appear on the General Practice Patient Survey, 2011–2012; all scores based on the percentage values for the two most positive responses. ADQ = average daily quantities. STAR-PU = specific therapeutic group age–sex related prescribing units.

included in this study, adjusted for other demographic and practice factors, were associated with higher levels of antibiotic prescribing: the regression coefficients B in the eight models ranged from 1.98 (95% CI = 1.43 to 2.53) to 4.07 (95% CI = 3.49 to 4.65) (Table 2). All models had a high predictive power ranging from an r^2 value of 20.0% (Q21d) to 30.1% (Q29).

The B regression coefficient allowed direct estimation of the degree to which patient experience varied according to the volume of antibiotic prescribing. Thus, for example, the regression coefficient for Q21a, the rating of the GP 'giving you enough time', was 3.24 (Table 2). A 25% reduction in antibiotic prescribing would be associated with a 0.81% (25% × 3.24) decrease in satisfaction for this item; this corresponded to a 5-point reduction in the national satisfaction rankings from the 50th to the 45th centile (Table 2).

Comparison with other prescribing indicators

In the regression model for overall satisfaction (Q28), antibiotic prescribing volume had the highest β value of all 14 prescribing variables included in the model (β = 0.08; P<0.001). All other prescribing variables had β values <0.06 (Table 3). The r^2 value for the original regression model based on overall satisfaction (Q28) and including antibiotic prescribing as the only prescribing predictor variable was 27.7%; additional prescribing variables only increased the predictive power by 0.1–2.9%.

DISCUSSION

Summary

Antibiotic prescribing was a significant determinant of patient experience, as elicited by the GPPS, both for satisfaction with the GP ('doctor domain' questions) and, to a lesser extent, for satisfaction with the general practice ('satisfaction domain' questions). Reductions in patient

Table 2. Antibiotic prescribing volumes as a determinant of patient experience scores (based on General Practice Patient Survey questions)

General Practice Patient Survey question[a]	Antibiotic prescribing volume, ADQ per STAR-PU per practice: adjusted regression coefficient, B value [b] (95% CI)	Extrapolated change in patient experience score, assuming a 25% reduction in antibiotic prescribing volume, %	Extrapolated change in patient experience centile ranking, assuming a 25% reduction in antibiotic prescribing volume (patient experience centile values in brackets)
Q21a: Rating of GP giving you enough time	3.24 (2.73 to 3.74)	–0.81	5 centiles (50th centile: 89.2%; 45th centile 88.5%)
Q21b: Rating of GP listening to you	3.19 (2.69 to 3.68)	–0.80	5 centiles (50th centile: 90.2%; 45th centile 89.5%)
Q21c: Rating of GP explaining tests and treatments	3.48 (2.93 to 4.03)	–0.87	5 centiles (50th centile: 85.9%; 45th centile 85.1%)
Q21d: Rating of GP involving you in decisions about your care	3.84 (3.20 to 4.48)	–0.96	5 centiles (50th centile: 78.7%; 45th centile 77.8%)
Q21e: Rating of GP treating you with care and concern	4.07 (3.49 to 4.65)	–1.02	6 centiles (50th centile: 86.6%; 44th centile 85.5%)
Q22: Confidence and trust in GP	2.39 (2.06 to 2.72)	–0.60	6 centiles (50th centile: 94.7%; 44th centile 94.1%)
Q28: Overall experience of GP surgery	1.98 (1.43 to 2.53)	–0.50	3 centiles (50th centile: 91.0%; 47th centile 90.5%)
Q29: Recommending GP surgery to someone else	3.08 (2.26 to 3.91)	–0.77	3 centiles (50th centile: 84.0%; 47th centile 83.3%)

[a]Questionnaire numbers as they appear on the General Practice Patient Survey, 2011–2012; all scores based on the percentage values for the two most positive responses. [b]All B values significant, P<0.01; all values adjusted for the practice and demographic variables included in the study. ADQ = average daily quantities. STAR-PU = specific therapeutic group age–sex related prescribing units.

Table 3. Predictors of overall patient satisfaction (Question 28, General Practice Patient Survey): β values for prescribing variables included in regression models[a]

Prescribing indicator	Adjusted regression coefficient, β
Antibiotic prescribing volume, ADQ per STAR-PU	**0.08**
Net ingredient cost, per 1000 registered patients	–0.01
Antidepressant prescribing, ADQ per STAR-PU	0.06
Hypnotic prescribing, ADQ per STAR-PU	0.01
Antipsychotic prescribing, ADQ per STAR-PU	0.04
Low-cost statins as a proportion of all statins	0.02
Ezetimibe as a proportion of all lipid-lowering drugs	–0.04
Cephalosporins and quinolones as a proportion of all antibiotics	–0.02
Oral NSAIDs, ADQ per STAR-PU	–0.01
Ibuprofen and naproxen as a proportion of all NSAIDs	0.06
Diclofenac and COX-2 inhibitors as a proportion of all NSAIDs	0.05
Antisecretory drugs and mucosal protectants, ADQ per STAR-PU	0.03
Inhaled corticosteroids, ADQ per STAR-PU	–0.03
Long- and intermediate-acting insulin analogues as a proportion of all insulins	–0.02

[a]Other predictor variables included in the regression models: eight demographic variables and three practice variables. ADQ = average daily quantities. COX-2 = cyclo-oxygenase-2. NSAID = non-steroidal anti-inflammatory drug. STAR-PU = specific therapeutic group age–sex related prescribing units.

experience scores associated with reduced antibiotic prescribing were noteworthy, especially when compared with relatively small variability in satisfaction scores. For example, practices prescribing 25% fewer antibiotics than the national mean could expect reductions in their patient satisfaction scores of between 0.5% and 1.0%. Although modest, these reductions in satisfaction were significant and consistent for all eight 'patient satisfaction' questions included in the GPPS. As practices have relatively similar satisfaction scores, this reduction in satisfaction has a bigger impact on the overall rankings, corresponding to a drop of 3–6 centile points in national satisfaction ranking.

Substantial reductions in antibiotic prescribing may be feasible.[8] These findings suggest that practices responding to the prospect of widespread antibiotic resistance by reducing antibiotic prescribing are likely to experience reductions in their satisfaction ratings.

The comparison with other prescribing variables confirmed the importance of antibiotic prescribing as a determinant of patient satisfaction. Other prescribing variables were weaker predictors of satisfaction and added little to the overall predictive power of the regression models. The comparison may not be entirely valid because many of these prescribing variables would only have applied to a small minority of GPPS responders. Some, however, such as hypnotic or antidepressant indicators, or the total cost of all drugs prescribed, were more likely to be relevant to questionnaire responders.

Strengths and limitations

This study has demonstrated that patients registered at practices that prescribe fewer antibiotics report lower levels of overall satisfaction, and satisfaction with the care of the doctor. The regression models all had relatively high predictive power. However, a cross-sectional observational study cannot in itself demonstrate causality and corroborating evidence is needed from longitudinal evidence of practices making large changes in their prescribing patterns and from qualitative interview data. Aggregated practice-level GPPS data do not provide information on whether questionnaire responders had themselves been prescribed an antibiotic, nor whether they had personal experience of expecting an antibiotic that was not prescribed by the GP. It is estimated that just under one-third of the population are prescribed an antibiotic in any given year.[17] It is likely, therefore, that most responders had not received an antibiotic in the preceding year. Antibiotic prescribing in itself may have acted as a proxy for some other aspect of the doctor–patient relationship related to satisfaction, such as the wish to please patients. Nevertheless, antibiotic prescribing was a far stronger determinant of satisfaction than the prescribing of, for example, hypnotic medication, which might also be considered a marker of the desire to please patients.

The antibiotic prescribing data obtained for this study were confined to prescriptions issued by the practice and thus omitted antibiotic prescriptions issued to registered patients attending an emergency department or out-of-hours centre. Omission of these data may have introduced confounding into the findings. It is possible that reduced volumes of antibiotic prescribing was a feature of practices with restricted access to appointments for patients who then obtained their supply of antibiotics elsewhere, and who reported subsequent dissatisfaction with their practice. A secondary analysis of the data was therefore conducted but no relationship was found between GP access (GPPS, question 12) and antibiotic prescribing volumes (results available from authors on request). It was not possible to obtain consultation rate data for each practice and it might be that practices with lower consultation rates may have 'transferred' their antibiotic prescribing for acute conditions to an emergency department or an out-of-hours centre.

Comparison with existing literature

This is the first national study to report the role of prescribing variables as determinants of patient experience. The associations remained when adjusted for confounding by other social and practice factors.

Decreased satisfaction has been reported following failure to prescribe antibiotics. In a study of 1014 patients with lower respiratory tract infections, patients who did not receive antibiotics that they had wanted were much more likely to express dissatisfaction.[18] Patient satisfaction is often cited by GPs as a reason for prescribing antibiotics, although this perception is often overestimated.[19] In another study of patients with acute bronchitis, treatment with antibiotics had no effect on patient satisfaction scores, whereas the perception of having been carefully examined was associated with increased patient satisfaction.[20]

Respiratory tract infections account for approximately one-half of all antibiotic prescribing in primary care and little is known about the determinants of patient satisfaction for antibiotic prescribing for other conditions. However, a Cochrane Review found no reduction in satisfaction for short courses of antibiotics in urinary tract infections.[21] In a study of almost 7000 Swedish patients registered at 39 practices, those registered at practices with higher antibiotic prescribing rates (antibiotic prescribing volume per GP consultation) were more satisfied, whereas this was partially offset by lower antibiotic prescribing in practices where the GP spent more time listening to the patient.[4]

The current study's findings differed and the GP characteristic of 'listening' was not associated with lower antibiotic prescribing. Differences in the way that the question on listening was phrased (the Swedish study emphasised the time spent listening rather than the attribute of listening) and between national and small-scale studies may account for conflicting findings.

Other studies have reported that more intensive interventions are associated with either enhancement of, or no reduction in, satisfaction following consultations for respiratory infections without an accompanying antibiotic prescription. Examples of these interventions include additional training in consultation skills,[22] use of a patient booklet,[22] or multiple interventions including group educational meetings, communication skills training, prescribing data feedback, pharmacist education, and educational material for patients.[23] Although maintaining patient satisfaction is achievable with additional input in a research setting, it remains unclear whether these gains can be maintained in routine practice and for all types of infection.

Implications for research

Having demonstrated an association between antibiotic prescription and patient satisfaction, further research is needed to interpret the possible trade-off between these two factors. Although small-scale studies have shown that dissatisfaction about not receiving an antibiotic can be offset if the patient feels that they have been listened to or carefully examined,[4] the extent to which this applies to all antibiotic prescribing is not known. This has particular importance to the growing problem of antibiotic resistance in primary care. GPs who wish to achieve more appropriate and targeted prescription of antibiotics will be supported by a better understanding of how patient satisfaction can be maintained in consultations when antibiotics are not prescribed.

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