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Factors Influencing Antibiotic Use in Acute Respiratory Tract Infections in Family Practice

SUMMARY

The authors of this paper assessed the effect of psychosocial and biomedical factors on the prescription rate for upper respiratory infections. Their study, using written clinical vignettes mailed to a random sample of Ontario family practitioners, achieved a 69% response rate. Family practitioners most often used physical signs and symptoms in forming their decision to prescribe antibiotics. Psychosocial data, when present in the vignettes, significantly modified the prescription rate, often overriding the biomedical factors alone. The study is another step in exploring a complex decision-making process (*Can Fam Physician* 1988; 34:2149–2152.)

RÉSUMÉ

Les auteurs ont évalué l'effet des facteurs psychosociaux et biomédicaux influençant les taux de prescription dans le cas d'infections respiratoires supérieures. Leur étude, par le biais de vignettes cliniques postées à un échantillon de médecins de famille ontariens, a suscité un taux de réponses de 69%. Le plus souvent, la décision de prescrire des antibiotiques reposait sur les signes physiques et les symptômes. Par ailleurs, les données psychosociales, lorsque présentes dans les vignettes, ont influencé de façon significative les taux de prescription, surpassant même les facteurs biomédicaux. Cette étude se veut une autre étape dans l'exploration de la complexité du processus de prise de décision.

Key words: antibiotics, respiratory-tract infections, decision making

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THE PRACTICE of prescribing antibiotics for acute upper respiratory tract infection (URTI) is widespread,[1–3] although the therapeutic effectiveness of these medications is questionable. Most studies show no difference in outcome between treated and untreated URTI patients.[1,2] Only two studies[3,4] have shown a difference between treated and placebo groups: in one[3] the differences were small and of uncertain clinical significance, while in the other[4] there was a trend for symptoms to diminish more rapidly in treated non-smokers.

According to the literature, a variety of factors relating to physicians and patients influence antibiotic prescribing habits. Physician variables include attitudes to health care,[5] variations in diagnostic criteria,[6,7] and different perceptions of patients' expectations.[8] Patient variables include their medical history,[9] their previous response to therapy[10] and their physical signs and symptoms.[11]

Only one study has measured the impact of psychosocial information on the antibiotic prescription rate.[12] This study used sore throat as the presenting complaint, and physicians were presented with a series of clinical vignettes which contained differing social and psychological information. In seven out of 12 clinical situations presented, the addition of psychosocial information in the vignette led to increased prescribing of antibiotic medications.

No study has looked at the combined effect of physical signs, symptoms, and psychosocial information on the prescribing rate for antibiotics

in URTI. The present study was conducted to determine whether various combinations of biomedical and psychosocial factors presented in clinical vignettes were predictive of a community family physician's decision to prescribe antibiotics to patients with URTI.

Methods

An initial study was carried out to determine which factors should be included in the vignettes to be used in the main study. Volunteer physicians in both academic and private practices were asked to record their reasons for prescribing antibiotics to patients with URTI whom they were seeing.

The factors chosen for the main study were those most frequently reported in 339 patient encounters during the pilot period. These were:

1. productive cough;
2. duration of illness;
3. throat inflammation (other than tonsilitis);
4. abnormal chest signs;
5. elevated temperature;
6. an upcoming social event for the patient;
7. the physician's sense of pressure to prescribe for the patient;
8. anxiety on the part of the patient.

These eight symptoms, signs and psychosocial factors were then systematically combined into clinical vignettes on the basis of a fractional factorial design,[13] and 32 vignette combinations were finally selected out of a possible 256. These 32 vignettes provided maximum information about the effect of single factors and combinations of two factors. An example of a vignette with only one factor is:

> A patient presents in your office with a history of URTI. The only positive physical finding is that he has a temperature of 38.5C°.

A vignette with several factors is:

> Another patient phoned your nurse asking for penicillin. He was told to come in, and when he arrives, he tells you that he has had a cough productive of yellow sputum. He mentions that he plans to go to Europe on business in two days time and is concerned that his trip may be in jeopardy. You check him over and find only some coarse crepitations in the large airways.

Six volunteer physicians completed the vignettes on two occasions to establish the vignettes' reliability.

The main study was a mail-out to family physicians in Ontario selected at random from the mailing list of the College of Family Physicians of Canada. Only physicians in active family practice were included in the study, and retired, academic, industrial physicians, and those graduating before 1940 were excluded from the sample. The sample size was set at 300, and this was considered adequate to detect small differences. The selected physicians were asked their year of graduation, number of years in practice, whether they held certification from the College, and the location and type of their practice. They were sent a booklet of vignettes, an answer sheet, and a stamped return envelope. They were asked to indicate whether or not they would prescribe antibiotics for the patients described in the 32 vignettes. Two follow-up mailings were carried out to ensure an adequate response rate.

Results

The overall response rate to the questionnaire was 69%. The demographic data of the study respondents is summarized in Table 1. No demographic differences were established between early and late responders. The only significant demographic difference between responders and nonresponders was that responders were more likely to be Certificants of the College of Family Physicians of Canada.

The mean prescription rate of the responders was 50% (SD ± 20%, range 9%–100%). The overall prescription rate was independent of demographic variables, but increased as factors were included in the vignettes. With one factor present, for example, the prescription rate was 20%, while with six factors present, the prescripton rate reached 74%.

Multiple t-test analysis used a conservative level of significance of $p = .001$. Table 2 summarizes the

Table 1
Demographics of Study Responders

Physician Data	%
Practice type:	
group	48.6
solo	51.4
City size:	
large	58.7
medium	6.9
small	22.8
rural	11.6
Year of graduation	
'71–'80	50.0
'61–'70	24.2
'40–'60	25.8
Certificant of College of Family Physicians of Canada	
Yes	66.8
No	33.2

Table 2
Summary of Effect of Individual Factors on Prescribing Rate

Description of Factor	Prescription Rate (% of physicians prescribing) Factor Present (%)	Prescription Rate (% of physicians prescribing) Factor Absent (%)	T value (Comparing prescription rate with factor present/absent)
Throat signs	49.2	51.7	3.064
Productive cough	61.6	39.3	–24.57[a]
Abnormal chest signs	67.5	33.4	–28.22[a]
Elevated temp.	61.2	39.7	–21.35[a]
Upcoming event	52.4	48.6	–1.65
Pressure on physicians	49.1	51.9	6.946[a]
Patient anxiety	52.6	48.4	–2.37
Duration of 7 days	53.8	47.1	–6.75[a]

Note: For 50 tests, significant p value = 0.001.
For this value –3.09 T + 3.09.
a. Significant at p 0.001 level.

effect of each factor on the prescription rate. The summary compares the prescription rate when a factor was present in the vignettes to the rate when that factor was absent. The effect of combinations of two factors on the prescription rate is summarized in Table 3. The social factor of an "upcoming event" was further subdivided, as it included several different types of events. The effect of these events on the prescription rate is summarized in Table 4.

Discussion

The survey respondents were representative of the total sample in all but one characteristic: as already noted, respondents were more likely to be Certificants of the College of Family Physicians of Canada. Among respondents, however, prescription rates were not influenced by Certificant status, and so this difference should not limit the generalizability of the study.

We found that the amount and type of information presented in the vignettes influenced the reported prescription rate, to the effect that increasing information led to an increase in prescriptions. This finding contrasts with results of previous studies[14] reporting that less information was used in the decision to prescribe than in the decision not to prescribe. This difference may have resulted from variations in study format and clinical data used. The major factors that influenced prescribing when presented alone were physical signs and symptoms, with the exception of "throat inflammation", which did not exert an influence.

For the factors of "productive cough" and "abnormal chest signs" our results were consistent with those recorded in other literature,[11] which shows that the presence of such factors leads to increased prescribing. The literature has not reported the influence that we detected of factors such as "elevated temperature" and "duration of illness". Fever is often part of both viral and bacterial illnesses, and so whether it was used by our study physicians as an indicator for antibiotic prescription is unclear. Perhaps physicians assumed that the presence of fever signified a more serious illness. Similarly the factor "duration of illness" may have led the physician to believe that an illness lasting more than seven days is likely to be bacterial in origin and so requires treatment.

The only psychosocial factor in our study that was found to affect a physician's likelihood to prescribe was "a sense of pressure to prescribe". In contrast to researchers in other studies,[12,15] we found that the presence of this factor resulted in *less* antibiotic prescribing. It may be that this finding resulted from our use of written vignettes and answers.

For the two-factor combinations patterns were complex. These combinations are summarized in Table 3. The factors of "a sense of pressure to prescribe" and "an up-coming event" were dominant when combined with other factors that tend to exert an opposite effect on the prescribing rate. For example, when the factor "pressure to prescribe" is added to the symptom factor "productive cough", the combination strongly increased the prescribing rate. By contrast, the factor "patient anxiety" further increased the prescribing rate when it was combined with a physical factor. These interactions show that psychosocial factors strongly modify prescribing decisions when they are presented in vignettes.

The factor combinations, then, are interactive. Thus the combination "productive cough" and "duration of illness greater than seven days" significantly decreased the prescribing rate, but this decrease apparently depends on the absence of chest signs. If the factor of "absent chest signs" is added to "illness lasting longer than seven days", the prescribing rate decreases.

The factor "throat inflammation" dominated the factor "productive cough" and resulted in a decrease in prescribing. In such cases, the physician may assume that the combination of throat signs and cough indicates a more widespread, and probably viral, illness.

Whether these results can be extrapolated to indicate how physicians behave in real life depends on the validity of clinical vignettes, which have certainly been seen[16] as a reasonable approximation of clinical

Table 3
Relationship between Two-Factor Combinations and Prescription Rate

2-Factor Combinations		
Factor One	**Factor Two**	**T Value**
Throat signs	+ productive cough	12.58[a]
	+ abnormal chest signs	1.31
Productive cough	+ abnormal chest signs	–2.46
	+ elevated temperature	2.92
	+ upcoming event	8.45[a]
	+ pressure on physician	10.36[a]
	+ patient anxiety	–4.37[a]
	+ duration of illness than 7 days	9.64[a]
Abnormal chest signs	+ elevated temperature	–11.99[a]
	+ upcoming event	3.63[a]
	+ pressure on physician	4.41[a]
	+ patient anxiety	–6.08[a]
	+ duration of illness than 7 days	–4.64[a]

a. Significant at $p > 0.001$ level.
Note: Negative T-value = increase in prescription rate, over & above rate due to single factor alone.
Positive T-value = decrease in prescription rate.

Table 4
Components of Factor "Upcoming Event" and Mean Prescription Rate

Type of Upcoming Event	Mean Prescription Rate (%)
1. Day before weekend	43.5
2. Day before holiday weekend	70.9
3. Upcoming holidays	53.3
4. Upcoming special events	43.5
5. Difficulty getting to clinic	59.5

decision making. In our study the mean prescribing rate of 50% is similar to that of another study[17] that used real patient encounters. This circumstance helps to support the suggestion that the use of vignettes such as we constructed is indeed a valid representation of actual decision making.

The complexity of the relationship between the factors described and the prescribing rate may be confounded by two other components of the decision-making process: the attitudinal beliefs of the physician and the nature of the doctor-patient interaction. The importance of these components and their effect on the decision to prescribe antibiotics needs further study.

Conclusions

The relationship between biomedical and psychosocial factors in influencing the prescribing behaviour of physicians is complex. Family physicians most often used physical signs and symptoms as aids in deciding to prescribe antibiotics, but psychosocial factors significantly modified their decisions, often overriding the influence of the physical signs and symptoms.

This study confirmed that there is a wide variation in the prescribing of antibiotics for patients with similar upper respiratory-tract infections, and used actual practice data in an attempt to explore further the influences inherent in a complex decision-making process. ■

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For Further Reading

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