Access to Point-of-Care Tests Reduces the Prescription of Antibiotics Among Antibiotic-Requesting Subjects With Respiratory Tract Infections

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BACKGROUND: General practitioners (GPs) often feel uncomfortable when patients request an antibiotic when there is likely little benefit. This study evaluates the effect of access to point-of-care tests on decreasing the prescription of antibiotics in respiratory tract infections in subjects who explicitly requested an antibiotic prescription. METHODS: Spanish GPs registered all cases of respiratory tract infections over a 3-week period before and after an intervention undertaken in 2008 and 2009. Patients with acute sinusitis, pneumonia, and exacerbations of COPD were excluded. Two types of interventions were performed: the full intervention group received prescriber feedback with discussion of the results of the first registry, courses for GPs, guidelines, patient information leaflets, workshops, and access to point-of-care tests (rapid streptococcal antigen detection test and C-reactive protein test); and the partial intervention group underwent all of the above interventions except for the workshop and access to point-of-care tests. RESULTS: A total of 210 GPs were assigned to the full intervention group and 71 to the partial intervention group. A total of 25,479 subjects with respiratory tract infections were included, of whom 344 (1.4%) requested antibiotic prescribing. Antibiotics were more frequently prescribed to subjects requesting them compared with those who did not (49.1% vs 18.5%, $P < .001$). In the group of GPs assigned to the partial intervention group, 53.1% of subjects requesting antibiotics received a prescription before and 60% after the intervention, without statistical differences being observed. In the group of GPs assigned to the full intervention group, the percentages were 55.1% and 36.2%, respectively, with a difference of 18.9% (95% CI: 6.4%–30.6%, $P < .05$). CONCLUSIONS: Access to point-of-care tests reduces antibiotic use in subjects who explicitly request an antibiotic prescription. *Key words: audit; respiratory tract infections; antibiotics; request; demand.* [Respir Care 2014;59(12):1918–1923. © 2014 Daedalus Enterprises]

Introduction

Many patients seek medical attention for respiratory tract infections such as cough, cold, and sore throat, most of which are viral in origin and can be managed without antibiotic therapy. Nonetheless, patients are often prescribed antibiotics for these conditions.[1] The overuse and/or misuse of antibiotics can lead to significant consequences, including increased cost, bacterial resistance, therapeutic failure, and adverse effects including drug toxicities and

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drug interactions.[2,3] The perception of general practitioners (GPs) regarding patient expectations for a prescription is a strong predictor for antibiotic prescribing.[4] When patients expect antibiotics, they are more likely to be prescribed,[5] and likewise, when physicians perceive that patients expect antibiotics.[6-8] Different studies show that GPs have difficulties in determining whether the patients actually expect antibiotic therapy.[9-11] There is compelling evidence that patients' satisfaction with the consultation is not affected by prescribing of antibiotics, and patient dissatisfaction has been shown to be significantly related only to poor communication between the patient and the doctor.[12,13]

Despite numerous papers on patients' expectations and physicians' perceptions and their impact on antibiotic prescribing for respiratory tract infections, few studies addressing the explicit request for antibiotics by patients during the consultation have been published. GPs often prescribe an antibiotic to fulfill patient demands in an attempt to satisfy the patient. GPs very often feel uncomfortable when coping with this demand, making the prescription of an antibiotic more likely compared with situations in which this demand does not occur.[14]

A prospective non-randomized before-and-after study was performed in primary care clinics in Spain as a part of the Health Alliance for Prudent Prescribing, Yield and Use of Antimicrobial Drugs in the Treatment of Respiratory Tract Infections (HAPPY AUDIT) project, a study financed by the European Commission.[15] The main objective of this study was to strengthen the surveillance of respiratory tract infections in primary health care through the development of intervention programs targeting GPs and patients. GPs from 6 countries participated in this study (Denmark, Sweden, Lithuania, Russia, Spain, and Argentina). The aim of the present study was to investigate predictors for subjects' request of antibiotics and evaluate the effect of access to point-of-care tests on antibiotic prescribing for respiratory tract infections among patients who explicitly requested a prescription of antibiotics.

QUICK LOOK

Current knowledge

Indiscriminate antibiotic prescribing practices can lead to ineffective therapy and may promote antibiotic resistance. Physicians are frequently pressured by patients with symptoms for an antibiotic prescription in the absence of confirmed bacterial infection. This conflict disadvantages both the physician and the patient.

What this paper contributes to our knowledge

Access to point-of-care testing results to confirm that infection reduced antibiotic use in subjects who explicitly requested a prescription for antibiotics. Availability of point-of-care testing results reduces unnecessary antibiotic utilization. Access to these results reduced antibiotic use in subjects who explicitly requested a prescription for antibiotics.

Methods

GPs were selected on a voluntary basis and registered all subjects with respiratory tract infections during a 3-week period, covering a total of 15 work days, in the winter months before (pre-intervention) and after an intervention (post-intervention). The data were registered on a sheet following a prospective self-registry methodology. The physician noted specific parameters related to the medical care, including subject age and sex, symptoms and signs, use of point of care tests (rapid streptococcal antigen detection test and C-reactive protein test), assumed diagnosis, treatment (decision and choice of antibiotics), and whether the subject requested an antibiotic.[15] Common cold, otitis media, pharyngitis, acute bronchitis, influenza, and other suspected viral respiratory tract infections were considered in this study. Patients with exacerbations of chronic bronchitis and/or COPD and pneumonia were excluded. Ethical approval was obtained from the Fundació d'Investigació d'Atenció Primària Jordi Gol (Barcelona, Spain; reference 44154).

Detailed information about the intervention can be found in the study protocol.[16] Briefly, 2 types of interventions were undertaken. One intervention (partial intervention) consisted of meetings with the GPs including prescriber feedback based on the results from the first registration, training courses on the diagnosis and treatment of respiratory tract infections, and review of guidelines on respiratory tract infections. The other intervention (full intervention) also involved access to 2 point-of-care tests in practice: (1) rapid antigen detection tests for the diagnosis of streptococcal pharyngitis and (2) C-reactive protein tests

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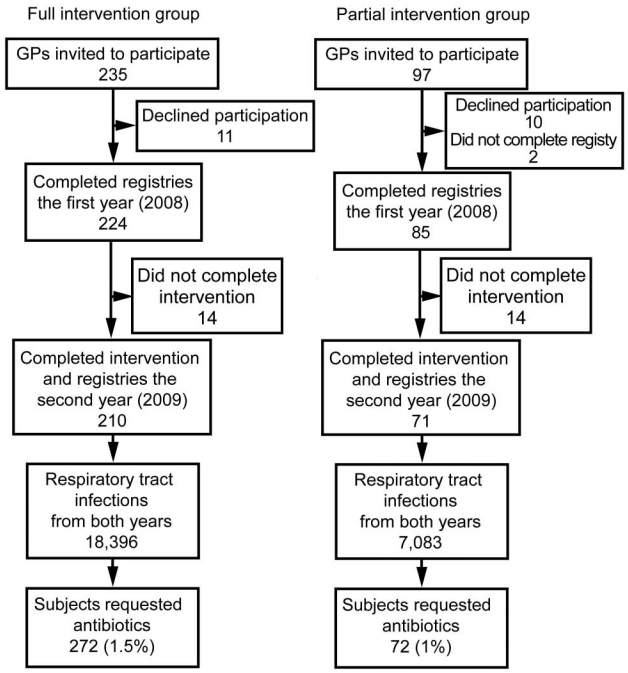

Fig. 1. Study flow chart. GP = general practitioner.

to support the GPs in distinguishing suspected bacterial from viral infections. GPs assigned to the full intervention group were instructed not to use the point-of-care tests as stand-alone tests but rather as additional tests in case of doubt: using rapid antigen detection test in subjects with pharyngitis and at least 2 Centor criteria (temperature $> 38°C$, tonsillar exudate or inflammation, tender cervical glands, and absence of cough),[17] and the C-reactive protein test in severe lower respiratory tract infections.[18] They were advised to withhold antibiotics in subjects with negative rapid antigen detection test results and C-reactive protein values < 20 mg/L and to consider antibiotic prescription in subjects with a positive rapid antigen detection test and/or a C-reactive protein result of > 100 mg/L.

Statistical Analysis

Descriptive and bivariate analyses were conducted. To identify potential predictors for subject request of antibiotics, we performed a multivariate logistic regression analysis that included age, prior duration of symptoms, gender, signs, and symptoms. Variables with $P < .1$ in the bivariate analysis were selected for inclusion in the multivariate model, and the final selection of variables was performed by the backward stepwise selection analysis. Significant differences were considered with a P value < 0.05.

Results

Figure 1 describes the general scheme of the study. A total of 25,479 subjects with respiratory tract infections were included, and, according to the GPs, 344 (1.4%, 95% CI [CI] 1.3–1.6) asked for an antibiotic, mainly for lower respiratory tract infections (Table 1). More subjects requested antibiotics from GPs assigned to the full intervention than from GPs allocated to the partial intervention (1.5% vs 1%, $P < .05$) (Fig. 1). Among subjects requesting antibiotics ($n = 344$), 169 (49.1%) received an anti-

Table 1. Characteristics of Subjects in the 2 Intervention Groups, Before and After Intervention

	Partial Intervention (Without Rapid Tests)		Full Intervention (With Access to Rapid Tests)		Total
	Pre	Post	Pre	Post	
Subjects, *n*	3,739	3,344	10,041	8,355	25,479
Common cold, *n* (%)	1,604 (42.9)	1,504 (45.0)	4,425 (44.1)	3,657 (43.8)	11,190 (43.9)
Otitis media, *n* (%)	122 (3.3)	122 (3.6)	228 (2.3)	160 (1.9)	632 (2.5)
Pharyngitis, *n* (%)	896 (23.9)	767 (22.9)	2,307 (22.9)	2,135 (25.6)	6,105 (23.9)
Acute bronchitis, *n* (%)	532 (14.2)	424 (12.7)	1,285 (12.8)	1,045 (12.5)	3,286 (12.9)
Influenza, *n* (%)	340 (9.1)	326 (9.7)	1,075 (10.7)	723 (8.7)	2,464 (9.7)
Other respiratory infections, *n* (%)	245 (6.6)	201 (6.1)	721 (7.2)	635 (7.6)	1,802 (7.0)
Age (y, mean ± SD)	41.4 ± 22.3	39.9 ± 23.3	45.1 ± 19.4	44.4 ± 20.3	43.6 ± 20.8
Male gender, *n* (%)	1,634 (43.7)	1,460 (43.7)	3,998 (39.8)	3,326 (39.8)	10,418 (40.9)
Days with symptoms (mean ± SD)	3.5 ± 3.7	3.7 ± 4.0	4.1 ± 4.3	4.2 ± 4.6	4.0 ± 4.3
Rapid streptococcal antigen detection tests performed, *n* (%)	23 (0.6)	31 (0.9)	75 (0.7)	1,492 (17.9)	1,621 (6.4)
C-reactive protein test performed, *n* (%)	0 (0)	0 (0)	3 (0)	685 (8.2)	688 (2.7)
Request for antibiotics, *n* (%)	32 (0.9)	40 (1.2)	156 (1.6)	116 (1.4)	344 (1.4)

Pre = pre-intervention
Post = post-intervention

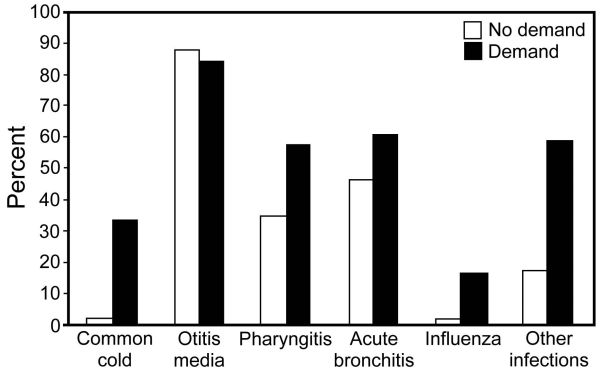

Fig. 2. Prescription of antibiotics depending on the type of respiratory tract infection and whether the subjects asked for an antibiotic or not.

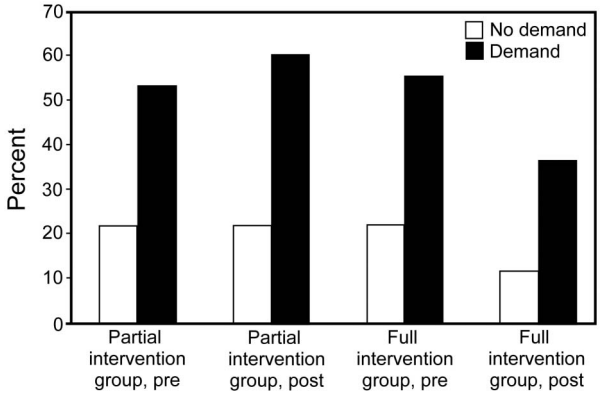

Fig. 3. Prescription of antibiotics depending on the group of physicians and whether the subjects asked for an antibiotic or not. preI = pre-intervention; postI = post-intervention.

biotic. Antibiotics were prescribed significantly less frequently when subjects did not request an antibiotic (18.5%, $P < .001$). The difference was, however, more obvious in those with a common cold, influenza, pharyngitis, and acute bronchitis (Fig. 2).

In the group of GPs assigned to the partial intervention (without point-of-care tests), 53.1% (95% CI: 35.8%–70.4%) of subjects were prescribed antibiotics before the intervention and 60% (95% CI: 44.8%–75.2%) after the intervention. In the group of physicians assigned to the full intervention (with access to rapid tests), 55.1% (95% CI: 47.3%–62.9%) of subjects were prescribed antibiotics before the intervention and 36.2% (95% CI: 27.4%–44.9%) after the intervention, with a difference of 18.9% (95% CI: 6.4%–30.6%, $P < .05$) (Fig. 3).

Table 2 shows the results of the multivariate analyses of the different predictors for subjects' request of antibiotics. Only age, fever, pain when swallowing, increased sputum production, and purulent sputum were significantly associated with a demand for antibiotics.

Table 2. Multivariate Logistic Regression Analysis of Factors That Predicted Subjects' Request for Antibiotic Prescribing in Respiratory Tract Infections

Variable	Odds ratio (95% CI)	*P*
Age	1.01 (1.00–1.02)	< .001
Prior days with symptoms	0.99 (0.97–1.02)	.50
Male gender	0.99 (0.81–1.20)	.89
Fever	1.70 (1.34–2.15)	< .001
Cough	0.92 (0.70–1.20)	.52
Purulent ear discharge	1.78 (0.86–3.68)	.12
Odynophagia	1.82 (1.43–2.31)	< .001
Tonsillar exudate	1.10 (0.71–1.72)	.66
Tender cervical glands	1.49 (1.01–2.20)	.04
Dyspnea	1.09 (0.71–1.66)	.50
Increased production of sputum	1.87 (1.42–2.46)	< .001
Purulent sputum	1.67 (1.16–2.43)	< .01

Of the 344 antibiotic-requesting subjects, rapid antigen detection tests were performed in 41 (11.9%) and C-reactive protein in 12 (3.5%). All point-of-care tests were undertaken by GPs assigned to the full intervention after the intervention. The streptococcal rapid test was negative in 35 subjects, with antibiotics being prescribed in only one case, whereas they were prescribed in the 6 positive results. Of the 332 subjects requesting antibiotics in whom a C-reactive protein test was not performed, antibiotics were given to 49.7% of the subjects, whereas they were only given in 4 cases out of the 12 subjects in whom this rapid test was performed (33.3%).

Discussion

This study shows that antibiotics are more likely to be prescribed to subjects with acute respiratory tract infections who request them than to subjects who do not explicitly request antibiotics. Moreover, an intervention aimed at promoting more prudent use of antibiotics by GPs can reduce the prescription of antibiotics, mainly when the GPs have access to rapid tests in their consultations. Negative rapid antigen detection test results and very low C-reactive protein values were associated with a lower prescription rate among antibiotic-requesting patients.

This study has some limitations. This study was not a clinical trial, and the groups were not assigned randomly. The percentage of physicians who stated that subjects had requested an antibiotic was very low in our study (only 1.4%), being much lower than what was reported by Coenen et al,[13] who observed a percentage of 10.2% in a study involving nearly 3,500 adult subjects with acute cough in 14 different European networks. In our study, approximately one third of the infections included corresponded to the common cold; in these cases, the request for an antibiotic was unlikely. However, subjects more frequently

requested antibiotics for lower respiratory tract infections. In our study, GPs were asked to tick off the box of request only when subjects explicitly demanded an antibiotic during the consultation for respiratory tract infection. Participation in a study on the rational use of antibiotics may have also influenced the GPs to prescribe antibiotics more rationally; however, the same GPs registered both the first and second registries.

To our knowledge, no other study has examined the effect of point-of-care tests on antibiotic prescribing when subjects request an antibiotic. In our study, GPs assigned to the partial intervention group, that is, without access to rapid tests, failed to reduce the prescription of antibiotics for antibiotic-requesting subjects, despite having undertaken a multifaceted intervention including feedback with discussion of their own results, training in guidelines, and the use of leaflets for subjects to back up their decision. However, training in communication skills, which has been shown to effectively deal with patients without prescribing antibiotics in other studies, was not carried out in the HAPPY AUDIT study.[19-21] Only those GPs assigned to the full intervention group significantly reduced the amount of antibiotics prescribed after the intervention had taken place. The only difference between the full and the partial intervention groups was the access to rapid tests, and this was associated with a 18.9% reduction in antibiotic prescribing. GPs might have been less likely to be influenced by subjects' demand for antibiotics when they had access to a rapid test that could help them to convince subjects that they did not need to take antibiotics.[22] This statement is also supported by the results of a published qualitative study aimed at exploring the views and experiences of 66 GPs using 2 interventions to optimize consultations for respiratory tract infections.[23] In this study, the C-reactive protein test was praised by the GPs, as it gave additional diagnostic information, which reduced the uncertainty as to whether antibiotics might be of value.[23] In these cases, GPs felt that the test supported a non-prescription decision, where relevant, and provided reassurance to subjects.

Conclusions

Patients' expectations for antibiotic prescribing have a strong influence on GPs' prescribing habits. In this audit-based study, GPs were more prone to prescribe an antibiotic when subjects explicitly requested it. This study also shows that physicians with access to rapid diagnostic tests prescribed fewer antibiotics when subjects explicitly asked for them in the consultation.

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