Effectiveness of a multiple intervention to reduce antibiotic prescribing for respiratory tract symptoms in primary care: randomised controlled trial

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Abstract

Objectives To assess the effectiveness of a multiple intervention aimed at reducing antibiotic prescription rates for symptoms of the respiratory tract in primary care.

Design Randomised controlled trial.

Subjects Twelve peer review groups including 100 general practitioners with their collaborating pharmacists in the region of Utrecht, Netherlands.

Intervention The intervention consisted of group education meetings, with a consensus procedure on indication for and type of antibiotics and with training in communication skills; monitoring and feedback on prescribing behaviour; group education for assistants of general practitioners and pharmacists; and educational material for patients. The control group did not receive any of these elements.

Main outcome measures Antibiotic prescription rates for acute symptoms of the respiratory tract and patients' satisfaction.

Results 89 general practitioners completed the study (89%). At baseline, prescription rates for antibiotics for respiratory tract symptoms did not differ between intervention and control group (27% *v* 29%, respectively). After nine months, the prescription rates in the intervention group fell to 23%, whereas the control group's rose to 37% (mean difference in change −12%, 95% confidence interval −18.9% to −4.0%). Multilevel analysis confirmed the results of the unadjusted analysis (intervention effect −10.7%, −20.3% to −1.0%). Patients' satisfaction was high and did not differ in the two groups at baseline or after the intervention.

Conclusions A multiple intervention reduced prescribing rates of antibiotics for respiratory tract symptoms while maintaining a high degree of satisfaction among patients. Further research should focus on the sustainability and cost effectiveness of this intervention.

Introduction

In the Netherlands, general practitioners prescribe almost 80% of all antibiotics, and up to two thirds of these prescriptions are issued for infections of the respiratory tract.[1] These infections are often treated with antibiotics, although this has mostly not been found to be beneficial.[2–6] Unnecessary use of antibiotics entails an increased risk of side effects,[2] high costs,[7] medicalising effects,[8] and development of bacterial resistance against antibiotics.[9–11] Although antibiotic prescribing rates in the Netherlands are low compared with other European countries[12] and the United States, as many as 50% of such prescriptions are estimated to lack an evidence based indication.[13] Non-clinical factors such as perceived patients' expectations play an important part in the decision whether or not to prescribe antibiotics.[14 15]

In a randomised controlled trial we evaluated the effectiveness of a multiple intervention aimed at reducing antibiotic prescription rates for respiratory tract symptoms in primary care.

Methods

Recruitment

We selected peer review groups in the region of Utrecht if the group consisted of at least four doctors. All members of the peer review groups had to agree about participation.

Randomisation

We thought that it was essential to achieve comparability between the intervention and control arms with regard to the volume of antibiotic prescribing (above or below the median), working in a rural or urban area, and the number of general practitioners per group (above or below median). On the basis of the above variables we therefore allocated the 12 peer review groups who agreed to participate to groups A or B, to achieve comparability. MMK, who was blinded to the composition of the groups, flipped a coin to determine whether group A became the intervention or control group.

Intervention

The intervention consisted of a group education meeting with a consensus procedure on, firstly, the indication for and first choice of antibiotics for acute otitis media, sinusitis, tonsillitis, and acute cough, combined with communication skills training. The second component was monitoring and feedback on prescribing behaviour six months after the intervention; the third, group education for assistants of general

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Table 1 Patients' characteristics in 2000 and 2001 in intervention and control group

	Intervention group (n=42)		Control group (n=47)	
Characteristic	**2000**	**2001**	**2000**	**2001**
No of patients	838	905	1059	818
No (%) of women	436 (52)	491 (54)	578 (55)	444 (54)
No (%) of diagnoses:				
Acute otitis media	60 (7.2)	68 (7.5)	74 (7.0)	63 (7.7)
Earache	13 (1.6)	21 (2.3)	19 (1.8)	21 (2.6)
Upper respiratory tract infection	235 (28.0)	249 (27.5)	262 (24.7)	179 (21.9)
Acute sinusitis	59 (7.0)	53 (5.9)	86 (8.1)	71 (8.7)
Sinus complaints	27 (3.2)	40 (4.4)	16 (1.5)	21 (2.6)
Acute tonsillitis	35 (4.2)	26 (2.9)	42 (4.0)	36 (4.4)
Sore throat	33 (3.9)	41 (4.5)	52 (4.9)	33 (4.0)
Acute bronchitis	83 (9.9)	78 (8.6)	106 (10.0)	75 (9.2)
Pneumonia	38 (4.5)	41 (4.5)	28 (2.6)	29 (3.5)
Asthma or chronic obstructive pulmonary disease	56 (6.7)	74 (8.2)	57 (5.4)	59 (7.2)
Acute cough	199 (23.7)	214 (23.6)	317 (29.9)	231 (28.2)
Mean age in years (SD)	31 (24)	29 (24)	30 (25)	29 (25)
Mean No of patients per doctor (SD)	20 (10.8)	22 (10.0)	23 (12.3)	17 (12.0)*
Satisfaction questionnaire				
No (%) of responses	422 (50)	361 (40)	505 (48)	411 (50)
No (%) of women responding	224 (53)	209 (58)	298 (59)	234 (57)
Mean age in years (SD)	32 (23)	32 (24)	33 (25)	33 (25)
Mean No of questionnaires per doctor (SD)	12.1 (7.7)	10.3 (5.3)	11.7 (7.0)	9.6 (6.7)

*Within group P<0.05.

practitioners and pharmacists; and the fourth, educational material for patients (see bmj.com for details).

The control group did not receive any part of the intervention.

Outcome measures

General practitioners registered all patients presenting with acute symptoms of the respiratory tract during three weeks in the autumn and winter of 2000 and 2001. Doctors noted diagnosis and management in patients' records as usual. Research assistants, who were blinded to the intervention status of the practices, extracted information on age, sex, diagnoses, antibiotic prescriptions, and referrals to hospital doctors.

After the consultation, general practitioners asked patients to fill in a questionnaire to rate their satisfaction with the consultation on a scale ranging from 1 (very dissatisfied) to 5 (very satisfied). Turkish and Arabic translations of this questionnaire were available.

Main outcome variables were the proportion of practice encounters for acute symptoms of the respiratory tract for which antibiotics were prescribed and the degree of patients' satisfaction with the encounter. Secondary outcome variables were insurance claims data over the period 2000-2, to assess differences in volumes of antibiotic prescribing before and after the intervention, independent from general practitioners' registrations and referral rates to hospital doctors, because we assumed that reduced antibiotic prescribing in primary care might increase hospital referral rates.

Analysis

We used *t* tests for unpaired samples. We performed a multilevel analysis to assess effectiveness, adjusted for clustering of general practitioners in practices and peer review groups and calculated intra-class correlation coefficients to rate the degree of clustering in practices and peer review groups.

Results

Forty two of the 48 peer review groups in the region of Utrecht were eligible and invited to participate. Twelve peer review groups (100 general practitioners) agreed to participate. Insurance claims data showed no differences in volumes of antibiotics prescribed in participating doctors compared with non-participating doctors. Out of 100 general practitioners who agreed to participate, 89 completed the study. General practitioners in both arms did not differ at baseline with regard to sex, practice characteristics, and mean period since registration as general practitioner (see bmj.com). Registered patients in both arms did not differ in 2000 and 2001 regarding age, sex, and type of diagnosis (table 1). Almost 80% (37) of the general practitioners (intervention group) participated in all parts of the intervention.

At baseline, mean antibiotic prescription rates for registered encounters for respiratory tract symptoms did not differ significantly between the two groups (27% *v* 29%, 95% confidence interval −9.1 to 5.0). In 2001, antibiotic prescription rates in the intervention group fell by 4% and those in the control group rose by 8% (table 2). Multilevel analysis confirmed the results of the unadjusted analysis (intervention effect −11%, −20% to −1%), while intra-class correlation coefficients showed that variation could be attributed to practice and group levels 0.17 and 0.09, respectively).

The multiple intervention did not change patients' degree of satisfaction; they remained very satisfied with the consultation (table 2). These results were also confirmed by multilevel analysis (intervention effect on patients' satisfaction −0.03, −0.2 to 0.1).

Claims data over 2000 and 2001 were in line with our results: no significant differences occurred in the number of antibiotic prescriptions between intervention and control group in 2000. In 2001, however, the mean number of antibiotic prescriptions had decreased by 9.7 prescriptions per 1000 patients (P=0.05 in the intervention group), whereas in the control group it had increased (P=0.60). This increase was also seen in the non-participating general practitioners in the same region (mean difference in change between intervention and control group −11.6 prescriptions/1000 patients, −23.2 to −0.03) and confirmed by multilevel analysis. After 15 months, the number of antibiotic prescriptions

Table 2 Registration of patients: changes in antibiotic prescription rates and patients' satisfaction in 2000 and 2001. Values are means with standard deviations unless otherwise indicated

	Intervention group (n=42)			Control group (n=47)			
Variable	**2000**	**2001**	**% change (SD)**	**2000**	**2001**	**% change (SD)**	**Mean difference of changes (95% CI)**
Antibiotic prescription rates (%)	27 (16.9)	23 (15.6)	−4 (15.6)	29 (16.6)	37 (18.1)	+8 (19.2)	−12 (−18.9 to −4.0)*
Patients' satisfaction (%)†	4.3 (0.3)	4.3 (0.3)	0 (0.4)	4.2 (0.4)	4.2 (0.3)	0 (0.4)	0 (−0.2 to 0.15)‡

*Intervention effect in multilevel analysis −10.7; 95% CI −20.3 to −1.0.
†1=very dissatisfied to 5=very satisfied.
‡Intervention effect in multilevel analysis −0.03; 95% CI −0.2 to 0.1.

in the intervention group was still lower than in the pre-intervention period (data not shown). Referral rates (about 2%) remained stable over time and did not differ between intervention and control groups (mean difference in change −0.1, −2.0 to 1.8).

Discussion

Potential biases

The fact that general practitioners may not have included all patients during the registration periods could have caused selection bias. This would be the case if doctors in the intervention group in 2001 tended to include patients for whom few antibiotics were prescribed compared with the control group. Importantly, since claims data over the same periods confirmed our findings and the case mix between intervention and control groups was similar, we assume that selection of patients is unlikely to have biased the results.

About half of the patients received and returned the patients' questionnaire. Non-response can at least partly be explained by the fact that not all patients were given a questionnaire by doctors, probably because of time constraints during the encounter; this can be considered as a more or less random phenomenon in both groups. Nevertheless, satisfied patients may be over-represented in our sample because general practitioners may tend to give out questionnaires to patients in whom they expected a high level of satisfaction. Importantly, however, this will not bias the results if satisfied patients are over-represented in both groups, as is most likely. Bias would occur only if general practitioners in one of the two groups were more inclined to administer questionnaires to satisfied patients than the doctors in the other group. We think this is highly unlikely.

Although our study was not powered to assess an intervention effect on individual diagnoses, the percentage of antibiotics prescribed decreased for all diagnoses in the intervention group compared with the control group except for pneumonia (data not shown). This was expected since antibiotic treatment is strongly recommended in cases of pneumonia.

Comparison with other trials

A randomised controlled trial of Zwar et al, which evaluated the effectiveness of an intervention consisting of prescribing feedback, educational material, patient educational materials, and face to face instruction for high or wrong prescribers, showed the same effect size,[16] whereas a more passively delivered complex intervention had little effect in changing practice.[17]

Outlook

Uncertainty remains about the sustainability of intervention effects.[18] However, claims data over the first trimester of 2002 provided a rough indication about the longer term effectiveness of this intervention. After 15 months, the number of antibiotic prescriptions in the intervention group was still lower than in the period before the intervention. It is possible that the peer review group structure reinforces the changed behaviour. Further research should focus on structural sustainability and cost effectiveness of these interventions.

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What is already known on this topic

Changing prescribing behaviour is a complex task

Many evidence based guidelines for infections of the respiratory tract are available

Implementation of guidelines is difficult

What this study adds

A multiple intervention consisting of four components reduced antibiotic prescribing rates

The intervention also maintained patients' satisfaction

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