Effect of antibiotic prescribing strategies and an information leaflet on longer-term reconsultation for acute lower respiratory tract infection

Michael Moore, Paul Little, Kate Rumsby, Jo Kelly, Louise Watson, Greg Warner, Tom Fahey, Ian Williamson

ABSTRACT

Background

Limited evidence suggests that delayed prescribing may influence future consultation behaviour.

Aim

To assess the effects of antibiotic prescribing strategy on reconsultation in the year following presentation with acute lower respiratory tract infection (LRTI).

Design of study

Balanced factorial randomised trial.

Setting

Primary care.

Method

Eight hundred and seven subjects, aged ≥3 years, had acute illness presenting with cough as the main symptom, plus at least one symptom or sign from sputum, chest pain, dyspnoea or wheeze. The subjects were randomised to one of three prescribing strategies (antibiotics, delayed antibiotic, no antibiotic) and a leaflet. Prior antibiotic use and reconsultation were assessed by medical record review.

Results

Patients who had been prescribed antibiotic for cough in the previous 2 years were much more likely to reconsult (incidence rate ratio [IRR] = 2.55, 95% confidence interval [CI] = 1.62 to 4.01) and use of a delayed prescription strategy is associated with reduced reconsultation in this group. In those with prior antibiotic exposure, there was a 34% reduction in consultation rate in the no antibiotic group (IRR = 0.66, 0.30 to 1.44, $P = 0.295$) and a 78% reduction for the delayed antibiotic group (IRR = 0.22, 0.10 to 0.49, $P<0.001$) when compared with those given immediate antibiotics. This effect was not observed in patients who had not been prescribed antibiotics in the previous 2 years; there was no reduction in consultations in the no antibiotic group (IRR = 1.23, 0.79 to 1.92, $P = 0.358$) or the delayed antibiotic group (1.19, 0.78 to 1.80, $P = 0.426$). There was an increase in consultation rate with an information leaflet (IRR = 1.27, 0.86 to 1.87, $P = 0.229$). Past attendance with cough, or past attendance with other respiratory illness and smoking, also predicted reconsultation with cough.

Conclusion

Delayed antibiotic prescribing for LRTI appears effective in modifying reconsultation behaviour, particularly in those with a prior history of antibiotic prescription for LRTI.

Keywords

anti-bacterial agents; primary health care; referral and consultation; respiratory tract infections.

INTRODUCTION

Preliminary evidence in acute sore throat suggests that delayed prescribing may influence future consultation behaviour.

Those with a recent history of antibiotic prescribing were much more than twice as likely to reconsult in the year following the index consultation with acute lower respiratory infection (LRTI). They showed substantial (78%) reduction in consultation following delayed prescribing compared with immediate prescribing.

Over time, utilising a delayed prescribing strategy is likely to result in sustained reduction in consultation for LRTI.

Background

Acute respiratory illness is the most common condition managed in primary care, and antibiotics are widely prescribed for LRTI despite limited evidence of benefit.[1–3] There has been a consensus for limiting antibiotic use in acute LRTI.[4,5] However, recent systematic reviews have come to different

***M Moore**, MRCP, FRCGP, senior lecturer; **P Little**, MSc, PhD, MRCP, FRCGP, professor of primary care research; **K Rumsby**, BA, trial manager; **J Kelly**, BSc, research assistant; **L Watson**, MSc, PhD, honorary senior research fellow; **I Williamson**, FRCGP, senior lecturer, Division of Community Clinical Sciences, University of Southampton, Southampton. **G Warner**, MRCGP, DCG, DRCOG, GP, Nightingale Surgery, Romsey; **T Fahey**, MD, FRCGP, professor, Department of General Practice, Royal College of Surgeons in Ireland, Dublin, Ireland.*

Address for correspondence
Michael Moore, University of Southampton, Division of Community Clinical Sciences, Primary Medical Care Group, Aldermoor Close, Southampton. SO16 5ST.
E-mail: mvm198@soton.ac.uk

Submitted: 31 March 2009; **Editor's response:** 26 May 2009; **final acceptance:** 13 July 2009.

 59: 728–734.

DOI: 10.3399/bjgp09X472601

conclusions about the likely effectiveness of antibiotics.[6,7] The debate continues unabated about the role of antibiotics because these reviews are relatively small (14 trials of 1500 patients).[1]

The study's hypothesis was that prescribing antibiotics for self-limiting illness is likely to reinforce belief in the effectiveness of antibiotics, leading to a cycle of reconsultation and further antibiotic prescribing. While placebo-controlled trials are clearly important to assess efficacy, open trials are vital when outcomes include patient perceptions, beliefs, satisfaction, and return rate to the clinic.[8] One previous open trial was sufficiently powered to show the effect of antibiotic prescribing on beliefs and attendance behaviour in upper respiratory tract infection (URTI) — either not prescribing or delaying antibiotics reduced reconsultation by up to 40%.[9] A prior history of antibiotic prescribing was also an important predictor of reconsultation. Moreover, analysis of a routine UK primary care dataset demonstrated a link between prescribing rates and consultation rates across a wide range of respiratory infections.[10] The publication of these data may have contributed to changing GPs' attitudes to prescribing for URTI and has probably helped lead to a sustained reduction in prescribing for URTI.[11]

There has been no other trial adequately powered to assess the issue of reconsultation behaviour for respiratory infections, nor to confirm the provisional findings that the delayed approach may have the lowest reconsultation rates.[9] It is also unclear whether these findings can generalise to LRTI, which has a much longer natural history. The relative importance of prescribing strategies and of information about natural history is also unclear; preliminary evidence suggests that provision of an information leaflet can affect return rate and antibiotic use in LRTI.[12,13]

Presented here are data from a 1-year follow-up of a study designed to assess the merits of three prescribing strategies in LRTI, that is, immediate prescribing, delayed prescribing, or no prescription.[14,15] These alternative prescribing strategies were not found to influence the duration of cough following the index consultation.

The objectives of this study were to assess: the effect on longer-term reconsultation behaviour of three different prescribing strategies and an information leaflet for LRTI; and whether previous antibiotic prescribing predicts the effect of prescribing strategies on reconsultation behaviour.

How this fits in

Antibiotics are of limited benefit in most acute respiratory illness and delayed antibiotic prescribing has become an accepted management strategy. Preliminary evidence in acute sore throat suggests that delayed prescribing may influence future consultation behaviour. Those with a recent history of antibiotic prescribing were much more than twice as likely to reconsult in the year following the index consultation with acute lower respiratory infection (LRTI) and showed substantial (78%) reduction in consultation following delayed prescribing compared to immediate prescribing. Over time utilising a delayed prescribing strategy is likely to result in sustained reduction in consultation for LRTI.

METHOD

Inclusion criteria

Details of this study are fully described elsewhere.[14] Thirty-six family practitioners in the Wessex region of the UK recruited 807 previously well patients. Patients were aged ≥3 years with acute illness (≤21 days) presenting with cough as the main symptom and with at least one symptom or sign localising to the lower tract (sputum, chest pain, dyspnoea, wheeze) — that is, using the same criteria as previous large cohorts of patients with LRTI.[16,17]

Exclusion criteria

Patients with history/physical examination suggestive of pneumonia based on the British Thoracic Society guidelines were excluded,[18] that is, new focal chest signs combined with systemic features. Patients clinically diagnosed with asthma, other chronic or acute lung diseases, cardiovascular disease, major current psychiatric diagnosis, mental subnormality or dementia; or with complications from previous episodes of LRTI (for example, hospital admission for pneumonia) were also excluded.

Randomisation

Randomisation was required within the consultation using sealed, numbered envelopes to make the prescribing strategies feel the most natural to patients and to have advice sheets immediately available to GPs. The well-known issues of potential subversion using this method were minimised by careful attention to equipoise among recruiting clinicians, most of whom had a close relationship with the research centre. Auditing of the envelopes and the baseline characteristics of patients revealed no evidence of subversion.[3] Patients were randomised to one of six groups defined by two factors:

1) Leaflet
- leaflet; or
- no leaflet.

2) Antibiotic prescription
- a course of antibiotics immediately (amoxicillin

Table 1. Loss to follow-up and unadjusted reconsultation rates by randomised group.

	No leaflet			Leaflet		
	No antibiotic	Delayed antibiotic	Immediate antibiotic	No antibiotic	Delayed antibiotic	Immediate antibiotic
Randomised	133	136	133	140	136	129
Notes unavailable for follow-up (%)	18 (14)	29 (21)	31 (23)	30 (21)	26 (19)	15 (12)
Reconsultation rate by randomised group (variance)	0.22 (0.28)	0.22 (0.32)	0.41 (0.74)	0.50 (1.1)	0.32 (0.60)	0.25 (0.35)

250 mg three times daily 10 days; 125 mg if aged ≤10 years; erythromycin 250 mg four times daily if penicillin allergic); or

- no offer of antibiotics; or
- delayed antibiotics: a course of antibiotics on request if symptoms were not resolved after 10 days.

The leaflet was simple, on one page, and included information about the natural history of LRTI,[12,19] and addressed patients' major worries previously reported in the literature for this condition.[19] For each group there were a small number of statements for the doctor to read out relating to advice to take analgesics, the likely natural history of the illness, and supporting the proposed prescribing strategy, thus generating a placebo effect in each group.[8] Once allocated to treatment/leaflet group, patients were subject to routine care and follow-up; no additional microbiological or radiological investigations other than those clinically indicated were instituted.

Symptom diary

Patients — or with parents' help if aged <16 years — completed a validated daily symptom diary[20] and recorded their temperature. The diary items recorded included antipyretic use and six symptoms: cough, dyspnoea, sputum production, wellbeing, sleep disturbance, and activity disturbance. Each was scored 0 = no problem, 1 = very little problem, 2 = slight problem, 3 = moderate problem, 4 = bad problem, 5 = very bad problem, 6 = as bad as it could be.

Medical record review

The patients' medical records were reviewed without prior reference to study group. Reconsultation within 1 month is common and due to the management of the same illness, and have been reported previously.[14] This paper reports reconsultations after 1 month, which is likely to exclude most reconsultations due to ongoing symptoms in the current episode. It reflects more the longer-term effects on future attendance behaviour with subsequent illness episodes.

Analysis of return rates

Most patients (89%) had a year's follow-up. However, so as not to exclude those with shorter follow-up, and since there was no correlation between length of follow-up and return rate, the rate for all patients was calculated by using days of follow-up as the denominator with attendance events as the numerator. Negative binomial regression was used for a factorial study to allow for over-dispersion, and in models where past antibiotic prescribing was incorporated in the model, the study allowed for clustering according to the doctor. The interaction between past prescribing of antibiotics and the randomised antibiotic prescribing strategies was assessed. Since a highly

Table 2. Distribution of reconsultation for cough following the index consultation by randomised group.

	n (%)			
	Immediate antibiotic	Delayed antibiotic	No Antibiotic	Total
No reconsultation	128 (70)	133 (71)	135 (66)	396 (69)
Reconsultation in months after randomisation				
1	17 (9)	18 (10)	32 (16)	67 (12)
2	9 (5)	7 (4)	8 (4)	24 (4)
3	3 (2)	5 (3)	6 (3)	14 (2)
4–12	26 (14)	25 (13)	23 (11)	74 (13)

significant interaction was found the model is presented including the interaction.

RESULTS

The study sample of 807 included 136 children (<16 years) and 133 older patients (>60 years). Completed symptom diaries were returned by 562 (70%) and an additional 78 (10%) provided information about symptom duration and severity in a telephone interview. CONSORT guidelines were followed for reporting of the main trial findings. Baseline variables reported in the main study were well balanced. Smoking history was not reported but was also balanced between groups (no antibiotic = 23.9%; delayed antibiotic = 24.6%; immediate antibiotic = 25.5%).

Loss to follow-up (notes not available)

Notes were available in 664 (82%) patients and for data extraction in 658 (81%); these were similar between groups (Table 1). Most (61%) of the unavailable notes were from three practices due to clerical errors. There was no difference in baseline characteristics between those followed up (that is, notes available and information on cough available) and those not followed up in terms of age: <16 years, 114/653 (17%) versus 22/146 (15%) respectively; a history of fever, 226/648 (35%) versus 51/146 (35%); dark green sputum, 268/648 (41%) versus 59/142 (42%); severity of cough on day 1, 3.9 versus 4.0; and duration of moderately bad cough, 6.0 versus 5.7.

Distribution of return consultations

The largest number of return consultations (*n* = 67) was in the first month after the index consultation (that is, excluded from this analysis). Consultations in month 2 remain slightly higher, but in subsequent months reconsultation falls to low levels (Table 2).

Table 3. Past history in predicting rate of reconsultation with cough (from 1 month to 1 year after seeing the doctor).

	Adjusted IRR[a] (95% CI)	*P-value*
Number of reconsultations with cough in past 2 years		
0	1	
1	2.03 (1.09 to 3.78)	0.026
≥2	4.52 (2.58 to 7.90)	<0.001
Number of reconsultations with other RTIs in past 2 years		
0	1	
1	0.90 (0.54 to 1.49)	0.674
≥2	1.93 (1.31 to 2.84)	0.001
Smoking (whether last recorded as smoking from notes)		
No	1	
Yes	1.49 (1.00 to 2.22)	0.050

[a]*The estimates for each variable controls for the effects of the other listed variables and for all variables in Table 3.*

The effect of past attendance behaviour and smoking

No variable from the consultation predicted reconsultation (prior duration of cough, duration of cough, fever, sputum, chest signs). However, past attendance with cough with other respiratory illnesses and smoking all predicted reconsultation (Table 3).

The effect of antibiotic prescribing in the consultation and prior antibiotic prescribing

In an analysis by randomised group that did not allow for the effect of prior prescribing, compared with immediate prescription of antibiotics, delayed prescription resulted in a small but non-significant reduction in reconsultation rate (IRR = 0.81, 95% CI = 0.51 to 1.28) and no difference in patients who did not receive a prescription (IRR = 1.05, 95% CI = 0.68 to 1.63).

The effect of antibiotic prescribing in the index consultation on reconsultation differed according to whether there had been antibiotic prescriptions for

Table 4. Current and past antibiotic prescribing in predicting rate of reconsultation with cough (from 1 month to 1 year after seeing the doctor).

	Adjusted IRR[a] (95% CI)	*P-value*
Prior antibiotic versus no prior antibiotic (antibiotic for cough in previous 2 years)	2.55 (1.62 to 4.01)	<0.001
Leaflet versus no leaflet	1.27 (0.86 to 1.87)	0.229
Randomised prescribing strategies (when no antibiotic for cough in previous 2 years)		
Immediate antibiotic	1.00	
No antibiotic	1.23 (0.79 to 1.92)	0.237
Delayed antibiotic	1.19 (0.78 to 1.80)	0.426
Randomised prescribing strategies (when antibiotic prescribed for cough in previous 2 years)[b]		
Immediate antibiotic	1.00	
No antibiotic	0.66 (0.30 to 1.44)	0.295
Delayed antibiotic	0.22 (0.10 to 0.49)	<0.001

[a]*The estimates for each variable controls for the effects of the other variables listed, for example, the incidence rate ratio for no antibiotic is 0.66, which means when no antibiotic is prescribed there is a 34% reduction in reconsultation rates when controlling for all the other variables listed.* [b]*These estimates are the interaction terms between prior antibiotic and randomised strategies.*

cough in the 2 years prior to the index visit. For patients who had not had antibiotics prior to index visit (536, 82%), the crude annual rates of consultation (that is, mean number of consultations per year) with cough were: immediate antibiotic group 0.24 (that is, 24 consultations per 100 individuals); no antibiotic 0.31; delayed antibiotics 0.29. In contrast, for patients with a history of antibiotic consumption prior to the index visit (124, 18%) the consultation rates were 0.63, 0.52 and 0.17 respectively. The estimated IRRs are shown in Table 4 for the negative binomial model, which allows for past antibiotic exposure and the interaction between past exposure and the randomised antibiotic group, and for clustering by doctor. In those with less than 1 years' follow-up, the mean duration of follow-up was 6 months (SD = 3 months). The exclusion of patients who had less than 1 year's follow-up made no difference to the estimates of return rate for patients who had received antibiotics in the previous 2 years (no antibiotics IRR = 0.66, delayed antibiotics IRR = 0.22). Similarly, the inclusion of all follow-up data (that is, including the month after seeing the doctor) resulted in very similar findings of the relationship between past and current prescribing.

DISCUSSION

Summary of main findings

To the authors' knowledge this is the first study to assess what factors predict consultation behaviour for one of the most common acute conditions managed in primary care, and in particular the effect of current and past antibiotic prescribing strategies. It demonstrates that delayed antibiotic prescribing for LRTI is probably more effective in modifying reconsultation behaviour. However, in this study the effect is only apparent among those patients who have previously had antibiotics for LRTI. This is the first study with sufficient numbers to allow some subgroup analysis and the assessment of interactions. Follow-up and analysis of consultation rates were planned a priori using electronic records, which provide an accessible and robust record of consultations.

Strengths and limitations of the study

The data was collected directly from patient records and the study administrator assessed the notes without prior reference to the group allocation. However, blinding is likely to be incomplete since a record of the treatment strategy and prescription will have been entered in the clinical record. Additionally, the study was unable to trace all the records, but there was no differential loss to follow-up between groups or differences in baseline characteristics. Not all patients were followed for a year, but nevertheless the results were unchanged when those with shorter follow-up were excluded. Although clear differences were found in reconsultation rates according to prior antibiotic consumption, the absolute reconsultation rates of those without prior consumption was low and the study may have been underpowered to detect a difference in this subgroup. Although unlikely, the study was unable from the data to determine whether the substantial reduction in consultation rates following a delayed prescription might be harmful, that is, that patients did not consult appropriately and developed complications of LRTI as a result. Concerns regarding the optimum rate of antibiotic prescribing have been previously raised.[21] A much larger prospective study is needed both to replicate the findings and to rule out the possibility of harm.

Comparison with existing literature

Acute respiratory infections are a major cause for primary care consultations in the UK. Attendance for respiratory illness accounts for approximately one-third of all primary care consultations. Of the 62% who attend with minor illness episodes, half are for acute respiratory illness.[3] More recent data confirm the impact of acute respiratory illness in a cohort of practices from the General Practice Research Database. The median practice experiences 388/1000 consultations (0.38 per patient per year) with a range in the other cohort practices between 125 and 1110/1000. In these same practices 78% of the consultations resulted in an antibiotic prescription in the median practice (range 45–96%).[10] Recent data suggest that there has been a sustained fall in both consultation rates and prescribing for acute respiratory infection in all age groups, but with the greatest change seen in young children.[10,22] This effect is not confined to the UK and changes have been linked to improved evidence of marginal benefit of prescribing.[21] The effect of prescribing on beliefs in the effectiveness of antibiotics, the intention to consult in the future, and actual consultation behaviour are all potential mediators of reduced consultation rates. The effect of prescribing on illness beliefs,[8] and future illness behaviour[9] has been previously described by this group for URTI. The results of this study suggest that using a delayed prescribing strategy is likely to have the greatest influence on future consultation behaviour, more so than not prescribing antibiotics. The current study shows a significant effect of delayed prescribing on reconsultation, which supports a previously observed trend from a previous study of URTI.[9] The lack of influence of the 'no prescription' policy on future consultation may appear counterintuitive but is consistent with that previously observed. It could be

speculated that the delayed prescribing strategy is more patient centred and results in better engagement with the patient. 'I acknowledge you are ill' (understanding the patient's view). 'I am sure you will get better without antibiotics' (positive consultation). 'If I am wrong, however, you can be in charge of, if and when, collecting the prescription' (involving the patient in management plan). Previous work on patient centredness indicates that this kind of consultation behaviour is associated with better outcomes[23] and qualitative work supports the notion that delayed prescribing is a popular strategy with patients.[24] Enhanced consultation skills incorporating the patient-centred model (but not delayed prescribing) have recently been demonstrated to be effective at reducing antibiotic prescribing for LRTI.[25] Not offering antibiotics has been advocated in LRTI,[4] but this strategy is associated with higher short-term reconsultation rate.[14] These data show only a marginal reduction in consultation rates in the longer term. This suggests that non-prescribing as a management option for LRTI needs review.

The reduction in future consultation observed after the delayed-prescription approach appears confined to those with a prior exposure to antibiotics who have the highest reconsultation rates; conversely, doctors will not encourage future reconsultation when using one-off prescriptions for patients who have not had antibiotics in the recent past. Over time, use of the delayed strategy would be expected to reduce consultation rates.

As with our previous study, the study confirmed that past attendance with respiratory infections is an important predictor,[9] as is smoking. The finding that delayed prescribing for LRTI was significantly effective at reducing reconsultation is also internally consistent in that one of the most powerful independent influences on future consultation was prior antibiotic use. Those issued a delayed prescription had an 80% chance of not using antibiotics, reducing prior exposure in the population.

Leaflets increase short-term reconsultation rates.[14] This is probably due to appropriate action by patients regarding severe symptoms, and may have a similar modest effect in the longer term, although the finding was not significant.

Implications for clinical practice

It is already known that prescribing for LRTI has at best marginal benefit for patients in terms of symptom relief. There is a growing body of evidence on the use of delayed prescribing,[26] which is advocated in the current NICE guideline on treatment of acute respiratory infection.[27] These data further support its use. Some argue that its main use may be in the shorter term as an interim measure before no antibiotics are offered.[26] However, there is still likely to be a continued place for delayed prescribing in offering a safety net for those who might otherwise develop complications and a useful strategy for those who develop expectations for antibiotics. This study shows that in conditions such as LRTI with long natural histories, for those patients who have had antibiotics previously, delayed prescribing is a powerful way of modifying both beliefs and consultation behaviour, and probably rather more effective than just 'saying no'.

Delayed antibiotic prescribing for LRTI appears effective in modifying reconsultation behaviour, particularly in those with a prior history of antibiotic prescription for LRTI.

Funding body

The study was funded by the Medical Research Council. The Medical Research Council did not participate in the design or conduct of the study. Neither did it participate in the collection analysis or interpretation of the data, or preparation review or approval of the manuscript (G108/322{2})

Ethical approval

This work was approved by the South West Multi Research Ethics Committee (99/6/35)

Competing interests

Dr Louise Watson has received consultancy fees from Actelion, Biogen Idec, GSK, Eli Lilly, Novartis, and Takeda. The other authors have stated that there are none

Acknowledgements

We are very grateful to the patients and practices who agreed to participate.

Discuss this article

Contribute and read comments about this article on the Discussion Forum: http://www.rcgp.org.uk/bjgp-discuss

REFERENCES

1. Huchon GJ, Gialdroni-Grassi G, Leophonte P, *et al.* Initial antibiotic therapy for lower respiratory tract infection in the community: a European survey. *Eur Respir J* 1996; **9(8)**: 1590–1595.
2. Smucny J, Fahey T, Becker L, *et al.* Antibiotics for acute bronchitis. *Cochrane Database Syst Rev* 2000; **(4):** CD000245.
3. McCormick A, Fleming D, Charlton J. *Morbidity statistics from general practice: fourth national study 1991–1992*. London: Office of Population Censuses and Surveys, 1995.
4. Gonzales R, Bartlett JG, Besser RE, *et al.* Principles of appropriate antibiotic use for treatment of uncomplicated acute bronchitis: background. *Ann Emerg Med* 2001; **37(6)**: 720–727.
5. Gonzales R, Sande MA. Uncomplicated acute bronchitis. *Ann Intern Med* 2000; **133(12)**: 981–991.
6. Fahey T, Stocks N, Thomas T. Quantitative systematic review of randomised controlled trials comparing antibiotic with placebo for acute cough in adults. *BMJ* 1998; **316(7135)**: 906–910.
7. Smith SM, Fahey T, Smucny J, Becker LA. Antibiotics for acute bronchitis. *Cochrane Database Syst Rev* 2004; **4:** CD000245.
8. Little PS, Williamson I, Warner G, *et al.* An open randomised trial of prescribing strategies for sore throat. *BMJ* 1997; **314(7082):** 722–727.
9. Little PS, Gould C, Williamson I, *et al.* Reattendance and complications in a randomised trial of prescribing strategies for sore throat: the medicalising effect of prescribing antibiotics. *BMJ* 1997; **315(7104):** 350–352.
10. Ashworth M, Charlton J, Ballard K, *et al.* Variations in antibiotic prescribing and consultation rates for acute respiratory infection in UK general practices 1995–2000. *Br J Gen Pract* 2005; **55(517):** 603–608.
11. Sharland M, Kendall H, Yeates D, *et al.* Antibiotic prescribing in

general practice and hospital admissions for peritonsillar abscess, mastoiditis, and rheumatic fever in children: time trend analysis. *BMJ* 2005; **331(7512):** 328–329.

12. Macfarlane JT, Holmes WF, Macfarlane RM. Reducing reconsultations for acute lower respiratory tract illness with an information leaflet; a randomised controlled study of patients in primary care. *Br J Gen Pract* 1997; **47(424)**: 719–722.
13. Macfarlane J, Holmes W, Gard P, *et al.* Reducing antibiotic use for acute bronchitis in primary care: blinded, randomised controlled trial of patient information leaflet. *BMJ* 2002; **324(7329):** 91–94.
14. Little P, Rumsby K, Kelly J, *et al.* Information leaflet and antibiotic prescribing strategies for acute lower respiratory tract infection: a randomised controlled trial. *JAMA* 2005; **293(24):** 3029–3035.
15. Moore M, Little P, Rumsby K, *et al.* Predicting the duration of symptoms in lower respiratory tract infection. *Br J Gen Pract* 2008; **58(547)**: 88–92.
16. Macfarlane JT, Colville A, Guion A, *et al.* Prospective study of aetiology and outcome of adult lower-respiratory-tract infections in the community. *Lancet* 1993; **341(8844)**: 511–514.
17. Macfarlane J, Holmes W, Gard P, *et al.* Prospective study of the incidence, aetiology and outcome of adult lower respiratory tract illness in the community. *Thorax* 2001; **56(2)**:109–114.
18. BTS Guidelines for the Management of Community Acquired Pneumonia in Adults. British Thoracic Society Standards of Care Committee. *Thorax* 2001 Dec; **56** Suppl **4**: IV1–64.
19. Cornford CS. Why patients consult when they cough: a comparison of consulting and non-consulting patients. *Br J Gen Pract* 1998; **48(436)**:1751–1754.
20. Watson L, Little P, Moore M, *et al.* Validation study of a diary for use in acute lower respiratory tract infection. *Fam Pract* 2001;**18(5)**: 553–554.
21. Cosby JL, Francis N, Butler CC. The role of evidence in the decline of antibiotic use for common respiratory infections in primary care. *Lancet Infect Dis* 2007; **7(11)**: 749–756.
22. Ashworth M, Charlton J, Latinovic R, Gulliford M. Age-related changes in consultations and antibiotic prescribing for acute respiratory infections, 1995–2000. Data from the UK General Practice Research Database. *J Clin Pharm Ther* 2006; **31(5)**: 461–467.
23. Little P, Everitt H, Williamson I, *et al.* Observational study of effect of patient centredness and positive approach on outcomes of general practice consultations. *BMJ* 2001; **323(7318)**: 908–911.
24. Everitt H, Kumar S, Little P. A qualitative study of patients' perceptions of acute infective conjunctivitis. *Br J Gen Pract* 2003; **53(486)**: 36–41.
25. Cals JWL, Butler CC, Hopstaken RM, Hood K. Effect of point of care testing for C reactive protein and training in communication skills on antibiotic use in lower respiratory tract infections: cluster randomised trial. *BMJ* 2009; **338:** b1374.
26. Arroll B, Kenealy T, Goodyear-Smith F, Kerse N. Delayed prescriptions. *BMJ* 2003; **327(7428)**:1361–1362.
27. National Institute for Health and Clinical Excellence. *Respiratory tract infections — antibiotic prescribing. Prescribing of antibiotics for self-limiting respiratory tract infections in adults and children in primary care*. London: NICE, 2008. http://www.nice.org.uk/nicemedia/pdf/CG69FullGuideline.pdf (accessed 2 Sep 2009).