Prospective case-control study of role of infection in patients who reconsult after initial antibiotic treatment for lower respiratory tract infection in primary care

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Abstract

Objective: To assess direct and indirect evidence of active infection which may benefit from further antibiotics in adults who reconsult within 4 weeks of initial antibiotic management of acute lower respiratory tract infection in primary care.
Design: Observational study with a nested case-control group.
Setting: Two suburban general practices in Arnold, Nottingham, over 7 winter months.
Subjects: 367 adults aged 16 years and over fulfilling a definition of lower respiratory tract infection and treated with antibiotics. 74 (20%) patients who reconsulted within 4 weeks for the same symptoms and 82 "control" patients who did not were investigated in detail at follow up.
Main outcome measures: Direct and indirect evidence of active infection at the time of the reconsultation or the follow up visit with the research nurse for the controls. Investigations performed included sputum culture, pneumococcal antigen detection, serial serology for viral and atypical pathogens and C reactive protein, throat swabs for detecting viral and atypical pathogens by culture and polymerase chain reaction, and chest radiographs.
Results: Demographic and clinical features of the groups were similar. Two thirds of the 74 patients who reconsulted received another antibiotic because the general practitioner suspected continuing infection. Any evidence of infection warranting antibiotic treatment was uncommon at reconsultation. The findings for the two groups were similar for the occurrence of identified pathogens; chest *x* ray changes of infection (present in 13%); and C reactive protein concentrations, which had nearly all fallen towards normal. Only three patients in the reconsultation group had concentrations ≥40 mg/l. Pathogens identified at follow up in the 156 patients in both groups included ampicillin sensitive bacteria in six. Atypical infections diagnosed in 27 (*Chlamydia pneumoniae* in 22) and viral infections in 54 had probably been present at the initial presentation.
Conclusion: Our study suggests that active infection, which may benefit from further antibiotics, is uncommon in patients who reconsult after a lower respiratory tract infection, and a repeat antibiotic prescription should be the exception rather than the rule. Other factors, such as patients' perception of their illness, may be more important than disease and infection in their decision to reconsult.

Introduction

Acute respiratory infections are the commonest reason for consulting a general practitioner, and over 30 million courses of antibiotics are prescribed annually for their treatment.[1] Despite this management, up to a quarter of adults treated for lower respiratory tract infections return to see their doctor, and most receive a further course of antibiotic, suggesting concerns about continuing infection.[2-4] Reconsultation causes considerable inconvenience for the patient and increased workload for the doctor and contributes to the documented excess use and costs of antibiotics in the community.[5]

We suggest that active infection is not the reason why patients with lower respiratory tract infection reconsult, and in an observational study including a nested case-control group, we investigated whether there is direct or indirect evidence of persisting or new infection which may justify the prescription of a further antibiotic in adults reconsulting after initial antibiotic management of lower respiratory tract infection in general practice.

Subjects and methods

A stable suburban population of 20 848 adults aged 16 and over is served by two general practices with six partners in Arnold, Nottingham (Stenhouse Medical Centre and Arnold Health Centre). Both practices are experienced in conducting research into lower respiratory tract infection and identifying all suitable patients, having participated in several studies.[2 3 6] We studied all adults who presented to the practices with acute community acquired lower respiratory tract infection between October 1994 and April 1995. The study was approved by the Nottingham City Hospital ethics committee. The case definition of lower respiratory tract infection was as previously reported[2 3] and

included a new or increasing, productive cough, associated with another symptom or sign of lower respiratory tract involvement including dyspnoea, wheeze, chest pain, or new signs on chest examination; and one or more constitutional symptom, including fever, sweating, headaches, aches and pains, sore throat, or coryza. Patients had not been given an antibiotic in the past 14 days but had been prescribed one for the illness at the consultation. The primary outcome measure was reconsultation with the doctor for the same illness within 28 days. Patients who returned for other reasons or only to obtain sickness certification were not considered to have reconsulted.

Each patient who entered the study had a standard history taken and examination performed by the doctor with previously designed data sheets,[2 3] provided informed consent, and completed a questionnaire. Both the doctor and the patient recorded independently an estimate of the severity of the illness on the basis of a whole number scale from 0 (perfectly well) to 5 (very severe). An initial blood sample for serology was taken from each patient. The choice of antibiotic was left to the doctor.

For those who reconsulted, the doctor filled out a standard follow up data sheet recording details of symptoms and signs, management including further antibiotic treatment and investigations, and the doctor's view as to why the patient reconsulted.

Nested case-control study

A nested case-control study was included to investigate in detail clinical and microbiological factors associated with reconsultation after initial treatment. To provide a "control" group, every third patient entered into the study was asked to come back to see the research nurse about 10 days later. Our previous studies had shown that this was the median time between initial consultation for lower respiratory tract infection and reconsultation.[2 3]

Patients who reconsulted and control patients were investigated in a standard way when they returned. Sputum samples (assisted by nebulisation of isotonic saline when necessary), throat swabs, and a second blood sample for serology were taken. Chest radiographs obtained within 3 days of the return visit were reviewed "blind" by a radiologist (DHR) experienced in research into lower respiratory tract infection.[2 3 6] Patients returned a month later for a third blood sample for serology.

Samples were held at 4°C and transported rapidly to the laboratory for standard investigations.[2] Isolation of bacterial respiratory pathogens from diluted sputum or the detection of pneumococcal capsular antigen was taken as evidence of infection, as was a fourfold rise in antibody titre to viral and atypical pathogens. Antibodies to *Chlamydia pneumoniae* were measured by microimmunofluorescence in the National Public Health Institute Laboratory in Oulu, Finland, by using *C pneumoniae* AR 39 or Kajaani 6 epidemic strains, or both.[7] A fourfold or greater rise in antibody titre, a high titre of 2048 (for IgG or IgA), or an IgM titre of 16 or more was considered evidence of infection (either reinfection or primary infection if IgM was present initially). C reactive protein concentrations were measured by the turbidometric method; values of 40 mg/l or over were taken as indirect evidence of active bacterial infection.[8-11]

Throat swabs were collected into ice cold sterile phosphate buffered saline and human placental ribonuclease inhibitor and subsequently stored at – 70°C in 10% dimethyl sulphoxide. All samples were inoculated into tubes of MRC5, C16, and Ohio HeLa cells. Influenza viruses A and B, parainfluenza, adenovirus, and respiratory syncytial virus were identified by culture and confirmed by immunofluorescent staining. Aliquots were examined by gene amplification by using the nested polymerase chain reaction for coronavirus, human rhinovirus, *Mycoplasma pneumoniae*, and *C pneumoniae* based on previously published methods.[12-14]

Levels of significance were computed with the χ^2 test for categorical variables and Students' *t* test for continuous variables.

Results

Findings at initial presentation

The general practitioners treated 440 patients for lower respiratory tract infection during the 7 winter months of the study. Seventy three patients (mean age 53 years; 40% men) were not entered into the study because they were unwilling or unable to participate (49), no research nurse was available (19), and for other reasons (5).

Details of the cohort of 367 patients studied are shown in table 1. Nearly two thirds had been previously fit and well; the commonest pre-existing conditions present in 40% included chronic lung disease in 82 and cardiac disease in 45.

The doctors' subjective illness severity score for the patients was a score 1 for 49 (13%), 2 for 157 (43%), 3 for 139 (38%), 4 for 22 (6%). The patients' scores were higher (that is, recording more troublesome symptoms) than the corresponding doctors' scores on 54% of occasions, the same for 43%, and less for only 3%. Amoxycillin was prescribed for 333 patients (91%); 29 (8%) received erythromycin and 5 (1%) received other antibiotics.

Patients who reconsulted

A total of 20% of patients (74/367) reconsulted with their general practitioner after a median of 9 (interquartile range 7-15) days. Of these, nine reconsulted a further time, making a total of 23% (83/367) extra consultations for the same symptoms within 4 weeks of the index consultation. The reasons patients gave were: symptoms no better or worse (24; 33%), symptoms only marginally improved (48; 65%); and antibiotic side effects (2; 2%). Patients had one or more continuing problems: cough with discoloured sputum (61%), dyspnoea (55%), wheeze (46%), general malaise (59%), and signs on chest examination (29%).

The doctors assessed that 40 (54%) patients had continuing infection and 19 (26%) had "postinfective reactivity,"; in 11 (15%) the infection was gone but symptoms were slow to clear, and four had other problems. They prescribed antibiotics to 62% (46/74) of patients: macrolide for 34, cephalosporin for 8, amoxycillin for 1, coamoxiclav for 1, and others for 2. Only one patient was referred to the hospital outpatient clinic.

Table 1 Comparative features at presentation for all 367 patients with lower respiratory tract (LRT) infection, 74 patients who subsequently reconsulted, 82 patients in follow up control group, and 211 patients not seen again expressed as numbers (percentages) with that feature. No significant differences unless indicated

Detail	All patients (n=367)	Reconsultation group (n=74)	Control group (n=82)	Patients not seen again (n=211)
Demographic data:				
Median (range) age (years)	46 (16-86)	46 (20-81)	48 (16-75)	46 (16-86)
Male:female ratio	47:53	45:55	52:48	46:54
Current or former smoker (others were never smokers)	196 (53)	39 (53)	47 (57)	109 (52)
Underlying disease (others were previously well)	142 (39)	26 (35)	34 (41)	82 (39)
Symptoms:				
Median (interquartile range) duration (days)	7 (4-16)	7 (3-14)	7 (4-12)	7 (4-16)
Cough with discoloured sputum (others had clear sputum)	323 (88)	61 (82)	77 (94)	185 (88)
No other LRT symptom present*	70 (19)	12 (16)	17 (20)	41 (19)
One other LRT symptom present*	106 (29)	21 (28)	31 (38)	54 (26)
Two other LRT symptoms*	107 (29)	22 (30)	19 (23)	66 (31)
Three other LRT symptoms*	84 (23)	19 (26)	15 (19)	50 (24)
History of fever	160 (44)	35 (47)	30 (37)	95 (45)
Upper respiratory tract symptoms	233 (63)	47 (64)	52 (63)	134 (64)
Systemic symptoms	224 (61)	40 (54)	54 (66)	130 (62)
Signs on examination:				
Chest clear	225 (61)	48 (65)	48 (59)	129 (61)
Generalised chest signs	102 (28)	21 (28)	25 (30)	56 (27)
Focal chest signs	40 (11)	5 (7)	9 (11)	26 (12)

*Denotes number of patients who had one or more other lower respiratory tract symptom present, including dyspnoea, chest pain, and wheeze.

Control patients in nested case-control study

One hundred and twelve patients were identified as potential controls at their initial visit. Twenty (18%) of these arranged to see the doctor again and so joined the "reconsultation" group and 10 did not turn up for the follow up visit, leaving 82 in the "control" group. They returned to see the practice research nurse after a median of 10 (interquartile range 8-14) days. The patients in the control group were selected in a systematic rather than random way, but they did not differ in demographic and clinical characteristics from those who did not reconsult. They therefore seemed to be representative of the population of patients who did not return to see the doctor.

Table 2 Results of microbiological investigations for 74 patients who reconsulted and 82 control patients at follow up. Values are numbers (percentages) positive of those tested

Detail	Reconsultation group (n=74)	Control group (n=82)
Patients with one or more pathogen identified	27/74 (36)	28/82 (34)
Pathogens identified:		
Bacterial infections	3/67 (4)	3/71 (4)
Streptococcus pneumoniae	2	0
Haemophilus influenzae	1	1
Moraxella catarrhalis	0	1
Staphylococcus aureus	0	1
Atypical infections	12/73 (16)	15/81 (19)
Mycoplasma pneumoniae	3	0
Legionella spp	0	0
Chlamydia psittaci	0	1
Chlamydia pneumoniae	8*	14
Coxiella burnetii	0	0
Viral infections	26/73 (36)	28/81 (35)
Influenza virus A	1	2
Influenza virus B	12	11
Respiratory syncytial virus	4	4
Parainfluenza virus 2	1	0
Coronavirus	6	10
Rhinovirus	2	1

*Also 1 Chlamydia spp.

Comparative features of patients who reconsulted and those who did not return to see the GP

The demographic and clinical features of the 74 patients who reconsulted were similar to the 211 who did not return and the 82 control patients (see table 1).

More patients who reconsulted than control patients had spent time in bed after initial consultation (19/64 *v* 9/72; $P<0.01$), and 47 (73%) recorded restriction of normal activities due to the illness compared with 31 (43%) control patients ($P<0.001$).

Results of investigations at follow up

Direct and indirect evidence of infection likely to benefit from antibiotics was uncommon in both groups at follow up (table 2). Bacterial pathogens, all ampicillin sensitive, were cultured from only six samples. No coliforms were isolated. Twenty seven atypical infections were diagnosed serologically, most commonly *Chlamydia pneumoniae* (primary infection in six, reinfection in the remainder). Chlamydial infection was not detected in any throat swabs by polymerase chain reaction. Of the 54 viral infections detected in 46 patients, the diagnosis was made by sequential serology in 21, viral culture in 9, and polymerase chain reaction in 25. One patient had positive results on both culture and serology (to influenza B).

The number of chest radiographs showing changes suggestive of infection at follow up was similar both for those who reconsulted (11/70; 15%) and the control group who did not (9/80; 11%), as were the concentrations of C reactive protein at initial consultation and at follow up. Overall 19/156 (12%) of both groups had concentrations of 40 mg/l or more at initial consultation as did 3/72 (4%) of those who reconsulted, but none of the controls, at the time of follow up. Only one patient (in the reconsultation group) showed a rise in concentration (26 mg/l to 68 mg/l) between the time of the initial contact and reconsultation. All other values had fallen or returned to normal at follow up apart from one patient in the reconsultation group and

one control patient in whom there was no significant change (17 mg/l to 18 mg/l and 23 mg/l to 25 mg/l, respectively).

Of the 39 patients thought by the doctor to have continuing infection at reconsultation and given antibiotics, only three had changes consistent with infection on chest radiography and only three had a C reactive protein concentration of 40 mg/l or more. Two had evidence of bacterial infection, 10 of viral infection, and five of atypical infection on investigation.

Discussion

We confirmed that lower respiratory tract infection was common in the adult population presenting to this group of general practitioners, with an annual incidence of 36 per 1000. This is similar to our previous finding of 44 per 1000 population, an estimate which, unlike in this study, also included patients seen on home visits.[2] Our study only ran over 7 winter months, but the results are probably applicable to the whole year as most respiratory pathogens, apart from legionellae, are commoner in the winter. Longitudinal studies of several years would be needed to pick up cyclical epidemics of pathogens such as *Mycoplasma pneumoniae*, which may influence the findings.[15]

Selection of controls

We chose our control group in a systematic way at the time of the initial consultation as we considered that it would be impractical either to ask all patients to return to see the research nurse for full investigations or to wait until a patient reconsulted before identifying a matched control and asking them to attend immediately for investigations. This method raises the possibility of bias, but we were satisfied that the control patients were similar to and seemed representative of those who did not return, and the interval between initial consultation and a second visit to the surgery was similar for those who reconsulted and the control group. In addition, the same proportion of patients identified as controls at the initial visit arranged to reconsult with their doctor as did those not asked to be controls.

Reconsultation

One in five patients reconsulted at least once within the month after initial antibiotic treatment for lower respiratory tract infection because they were not satisfied with their progress. The demographic and clinical features at initial presentation were similar for those who did and did not need to reconsult. During this reconsultation, the doctor prescribed a further course of antibiotics to nearly two thirds, usually because continuing infection was considered likely. We found that the doctors' impression of continuing infection, however, was rarely matched by objective evidence of infection. Near complete investigations in both those who reconsulted and control patients showed similar patterns with little direct or indirect evidence of active infection warranting antibiotics in either group. The numbers in each group were, however, too small to allow more accurate analysis of this observational data.

Infections identified in cases and controls

In only three of the patients who reconsulted were bacterial pathogens identified and none were ampicillin resistant. We did not find colonisation and infection by coliforms or other antibiotic resistant respiratory pathogens after initial antibiotic treatment to be a problem in this community. The limitations of sputum culture are well known, but it can be a valuable investigation in the primary care setting, even if antibiotics have been given.[16]

Chlamydial infection, largely due to *C pneumoniae*, was diagnosed serologically in 15% of all patients studied. This confirms reports that this is a not uncommon cause of lower respiratory tract infection in adults in the community.[7 17 18] It also provides some support to the doctors' choice of a macrolide for those patients who reconsult, although macrolides seem to offer no advantage over amoxycillin for initial treatment for lower respiratory tract infection.[3] Our detection rate of viral infection in a third of cases was considerably higher than in our previous study of lower respiratory tract infection,[2] largely because of better detection methods, including polymerase chain reaction, which doubled our diagnostic rate. We speculate that the viral and atypical infections were present at initial consultation rather than representing a secondary infection resulting in reconsultation. This is supported by the equal incidence of these infections in both reconsultation and control patients and the absence of chlamydial antigen and infrequency of viral isolation from throat swabs at relapse. It has been suggested that viral infections of the upper respiratory tract increase bacterial colonisation of the nasopharynx and the risks of secondary bacterial infection of the lower respiratory tract,[19] but we found no evidence for this.

Indirect evidence of active infection

C reactive protein concentrations were similar for reconsultation and control groups, and only 4% of patients had a concentration of 40 mg/l or over at reconsultation, suggesting that active bacterial infection was unusual in this group. These concentrations seem useful in differentiating viral and bacterial lower respiratory tract infection in adults[20-22] and children,[8-11] for guiding the decision about antibiotic treatment,[21] and for assessing severity of infection.[22] Concentrations at reconsultation had risen in only one patient, suggesting resolution of infection in the others. Initial C reactive protein concentrations or chest radiographic changes consistent with infection, when taken as markers of severity of infection, did not identify those more likely to reconsult. The proportion of all patients who had radiographic changes consistent with infection at follow up (13%) was the same as the proportion (12%) found at initial presentation in our previous study of lower respiratory tract infection,[2] suggesting that the changes were probably a feature of the primary illness rather than a later complication causing reconsultation.

Other factors affecting reconsultation

Clearly, other factors cause some patients to reconsult and some doctors to prescribe further antibiotics.[23-26] Patients' anxieties and previous consulting habits may be more important than factors related to infection.[27] In a recent study of sore throat, "legitimation" of the illness—to explain to work or school in 60% of cases and to family and friends in 37%—was an important reason for consultation.[28] The illness had considerably

Key messages

- Lower respiratory tract infections are very common, but even if they have been given antibiotics, a fifth to a quarter of patients reconsult and many receive further antibiotics
- No demographic or clinical features at presentation identify those who may reconsult
- Direct and indirect evidence of infection warranting antibiotics is uncommon in those who reconsult and no different to those who do not
- *Chlamydia pneumoniae* is the commonest infection identified in this study population
- Antibiotics should be the exception rather than the rule for patients who reconsult

more impact on the quality of life of the patients who reconsulted as measured by days in bed and inability to perform normal activities. The patient's perception that an "infection" is the problem and antibiotics the answer[29] may result in dissatisfaction at the speed of the natural recovery of the illness, particularly after treatment has been completed. The median reconsultation time was 2 days after antibiotics finished. Over half of the patients judged their illness to be more severe than their doctor did and very few less so, as has been noted before in general practice.[24] The prescription of a further antibiotic may perpetuate the concept of infection to the patient and heighten the consulting habit for the next episode of lower respiratory tract symptoms, producing a cycle of consultations powered by antibiotic prescriptions. In the absence of an alternative strategy, and when prescribing decisions are invariably made without the aid of investigations in general or the identification of an infection in particular, doctors have an uphill, time consuming, and difficult task to educate their patients not to require antibiotics. The results of our study may aid them in this task.

Conclusions

Our study shows that infection likely to benefit from antibiotics is uncommon in patients who reconsult after lower respiratory tract infection, and it suggests that a repeat antibiotic prescription should be the exception rather than the rule. If further antibiotics are judged necessary, a macrolide seems most appropriate. We found nothing to support the use of other groups such as β lactamase stable β lactams or quinolones. Our results should increase the confidence with which doctors can discuss these issues with their patients and thus contribute to reducing unnecessary antibiotic prescribing in the community.

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Conflict of interest: None.

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Endpiece

Overheard at a *BMJ* editorial meeting

The editor, responding to a suggestion that the *BMJ* should publish poems: "We've been publishing bad science for years. But bad poetry would be a really new departure."

Influence of patients' expectations on antibiotic management of acute lower respiratory tract illness in general practice: questionnaire study

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Abstract

Objective: To assess patients' views and expectations when they consult their general practitioner with acute lower respiratory symptoms and the influence these have on management.

Design: General practitioners studied consecutive, previously well adults and recorded clinical data, the certainty regarding their prescribing decision, and the influence of non-clinical factors on that decision. Patients completed a questionnaire at home after the consultation.

Setting: 76 doctors from suburban, inner city, and rural practices.

Subjects: 1014 eligible patients entered; 787 (78%) returned the questionnaire.

Main outcome measures: The views of the patient, the views of and antibiotic prescription by the doctor.

Results: Most patients thought that their symptoms were caused by an infection (662) and that antibiotics would help (656) and had both wanted (564) and expected (561) such a prescription. 146 requested an antibiotic, 587 received one. Of the 643 patients who thought they had an infection, 582 wanted an antibiotic and thought it would help. Severity of symptoms did not relate to wanting antibiotics. For those prescribed antibiotics, their doctor thought they were definitely indicated in only 116 cases and not indicated in 126. Patient pressure most commonly influenced the decision to prescribe even when the doctor thought antibiotics were not indicated. Doctors considered antibiotics definitely indicated in only 1% of the group in whom patient pressure influenced the prescribing decision. Patients who did not receive an antibiotic that they wanted were much more likely to express dissatisfaction. Dissatisfied patients reconsulted for the same symptoms twice as often as satisfied patients.

Conclusion: Patients presenting with acute lower respiratory symptoms often believe that infection is the problem and antibiotics the answer. Patients' expectations have a significant influence on prescribing, even when their doctor judges that antibiotics are not indicated.

Introduction

Acute lower respiratory tract symptoms are very common in primary care, and general practitioners prescribe antibiotics in three quarters of such consultations, labelling many as infection.[1 2] Increasing antibiotic prescribing, particularly for respiratory infections, contributes to rising drug costs and increasing antibiotic resistance of respiratory pathogens in the community.[3-5] We investigated patients' views about the cause of their illness and its management when they consulted with lower respiratory tract symptoms; the doctors' decisionmaking process when they prescribed; and how patients' views affect management.

Subjects and methods

Seventy six general practitioners in our Community Respiratory Infection Interest Group agreed to recruit consecutive, previously well adults (defined as over 15 years and not under supervision or treatment for underlying disease) who consulted with an acute lower respiratory tract illness (defined as new cough and at least one other lower respiratory symptom, including sputum production, dyspnoea, wheeze, or chest pain for which there was no other obvious explanation). This definition derives from published criteria for community respiratory syndromes[6] and our previous work.[3] Management was then left to doctors' discretion, who, during the consultation, completed a data form[1 7] that included their certainty as to whether antibiotics were indicated and also details of non-clinical "factors" influencing their decision. At the end of the consultation patients received a sealed envelope containing a confidential questionnaire (coded without their name) to complete at home and post to our research office. The patients were unaware of the views recorded by their doctor. The study had ethical committee approval, and patients gave informed verbal consent.

Data were analysed with EpiInfo 6 with statistical comparisons by χ^2 test for categorical variables and Student's *t* test for continuous variables. The number of patients studied (1000 evaluable patients) was determined not by this observational study but by the statistical power needed for a separate randomised study in which these patients participated regarding reconsultation and the effect of an information leaflet about the clinical course of the cough.[8] The leaflet, which was in a sealed envelope to be opened after completion of the questionnaire, included no reference to infection or antibiotics.

Results

The 76 participating general practitioners median age 42 (range 28-63) years) practised in a variety of settings: 11% rural practice, 18% inner city, and 71% suburban; 3% single handed, 54% in 2-4 partner practices, and 43% in larger practices. They returned data sheets on 1054 patients, of whom 1014 were evaluable and 40 excluded (34 had underlying diseases—mostly chronic lung disease, asthma, and diabetes; four were too young; and two had missing data); 69 general practitioners entered 10-16 eligible patients and seven entered 6-9. Questionnaires were returned by 787 patients (78%), which formed the basis of this study.

Table 1 compares the 787 patients who returned the questionnaire and the 227 who did not. The latter were significantly younger and more likely to be smok-

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Table 1 Comparative features of 1014 adults presenting with acute lower respiratory illness. Values indicate numbers (percentages) unless stated otherwise

Detail	Questionnaire returned (n=787)	Questionnaire not returned (n=227)
Demographic details:		
Mean (SE) age (years)	47 (0.6)	37 (1.03) (P<0.001)
Male:female ratio	39:61	43:57
Never smokers (others ex or current smokers)	407 (52)	98 (43) (P<0.03)
Symptoms:		
Median (interquartile range) duration (days)	7 (5-14)	7 (4-10)
Sputum discoloured	452 (57)	129 (57)
Sputum clear (others had dry cough)	146 (19)	46 (20)
Other lower respiratory tract symptoms	514 (65)	144 (63)
Upper respiratory tract symptoms	410 (52)	125 (55)
Systemic symptoms	343 (44)	116 (51) (P=0.054)
Signs*:		
Chest clear	503 (65)	147 (65)
General chest signs	171 (22)	53 (23)
Focal chest signs	77 (10)	22 (10)
Antibiotic prescribed	581 (74)	148 (65) (P=0.014)
Patient reconsulted (within 4 weeks)	140 (18)	42 (18)

*Chest not examined in additional 36 (3%) and 5 (2%) of each group.

ers, to have complained of systemic symptoms, and not to have received an antibiotic at the index consultation.

Patients' views

Typically, patients thought that their problem was caused by infection (85%) and that antibiotics would help (87%) (table 2). Most patients had both wanted antibiotics (72%) and had expected to be prescribed them (72%). A fifth of patients had asked for an antibiotic.

Correlations within patients' replies

In the following bivariate analyses, denominators vary as not all patients answered every question.

Of patients who thought they had an infection, nearly twice as many wanted an antibiotic and thought they would help. Of 643 patients who thought their symptoms were caused by an infection, 582 (90%) considered antibiotics would help compared with 27 of 55 (49%) who did not think that they had an infection ($\chi^2 = 74.5$; $P < 0.0001$). Of 657 patients who thought that an infection was present, 507 (77%) wanted antibiotics compared with 24 of 58 (41%) who did not think an infection was causing their illness ($\chi^2 = 33.9$; $P < 0.0001$).

Over a quarter of those who wanted antibiotics asked for them. Of 561 patients wanting antibiotics, 144 (26%) asked for them versus 1/104 (1%) who had not wanted antibiotics ($\chi^2 = 30.0$; $P < 0.0001$). One patient who asked for an antibiotic had not thought about wanting one.

Those wanting antibiotics were five times as likely to expect to be prescribed them. Of 561 patients who wanted antibiotics, 508 (90%) expected to be prescribed them compared with 18/104 (17%) who had not wanted them ($\chi^2 = 280$; $P < 0.0001$).

General practitioners' views

Table 3 shows the doctors' certainty in prescribing antibiotics and the influence of non-clinical "other factors" on their decision.

Of 581 patients (74%) prescribed antibiotics, the doctor considered them definitely indicated in only a fifth of cases and not indicated in nearly a quarter. Non-clinical "factors" influenced prescribing in 249 (44%) of those receiving antibiotics, usually patient pressure (133 (54%)).

Patients' opinions and general practitioners' actions

Patients wanting antibiotics were more than three times as likely to receive them. Of 564 patients wanting antibiotics, 495 (88%) received them versus 24/104 (23%) who did not want them ($\chi^2 = 208$; $P < 0.0001$).

Patients' views had a strong influence on prescribing. Of 125 patients given antibiotics even when the doctor thought that they were not indicated, 114 (91%) had wanted them. For the 570 patients receiving antibiotics, doctors stated their prescribing decision was influenced by patient pressure in 133 cases (23%). For these 133 patients, antibiotics were considered "definitely indicated" in only 1%, "probably indicated" in a third, and "not indicated" in two thirds. For the other 437 cases, when patient pressure was not present, doctors thought antibiotics were probably or definitely indicated in 91% and not indicated in only 9% (table 4).

Most patients expecting their doctor to prescribe antibiotics received them: of 560 patients expecting an antibiotic, 474 (85%) received them compared with 54/133 (41%) who did not ($\chi^2 = 112$; $P < 0.0001$).

Dissatisfied patients reconsulted twice as frequently. Of 37 patients expressing dissatisfaction with their doctor's decision to prescribe antibiotics or not, 13 (35%) reconsulted for similar symptoms within 4 weeks compared with 127/740 (17%) of satisfied patients ($\chi^2 = 7.0$; $P < 0.008$).

Patients wanting antibiotics but not receiving them were more likely to be dissatisfied with the consultation than those receiving them, but reconsultation rates were similar whether these patients received an antibiotic or

Table 2 Responses of 787 patients to individual questions presented in questionnaire. Values are numbers (percentages) of patients who answered the question

Question	Yes	No	Not thought about it
1. Do you *think* your problem is caused by an infection affecting the chest or breathing tubes? (n=780)	662 (85)	58 (7)	60 (8)
2. Did you *want* a prescription for antibiotics from your GP today? (n=781)	564 (72)	104 (13)	113 (15)
3. Did you *expect* your GP to give you antibiotics for your symptoms today? (n=779)	561 (72)	133 (17)	85 (11)
4. Did you *ask* your GP for an antibiotic today? (n=783)	146 (19)	637 (81)	Not offered
5. Do you *feel* antibiotics will help your symptoms? (n=758)	656 (87)	102 (13)	Not offered
6. Has your GP *prescribed* antibiotics for you today? (n=785)	587 (75)*	198 (25)	Not offered
7. Regarding this *decision* by your GP are you: (n=777)			
Satisifed	738 (95)	NA	Not offered
Dissatisfied	39 (5)	NA	Not offered
8. If you have been given a prescription, will you actually *take* the medicine? (n=586)	584 (>99)	2 (<1)	Not offered

GP=general practitioner. NA=not applicable.
*Of these, 581 were actually prescribed an antibiotic by their general practitioner.

not. Of 564 wanting an antibiotic, 77 (14%) did not get one. Of these, 22 (29%) were dissatisfied with the consultation and 12 (16%) reconsulted for the same illness within 4 weeks. For the remaining 484, only eight (2%) were dissatisfied and 91 (19%) reconsulted.

Attitudes of patients and their doctors

When patients wanted or asked for antibiotics doctors were much more likely to state that patient pressure had affected their decision. For the 555 patients wanting antibiotics, the doctor stated the decision to prescribe was affected by patient pressure in 124 cases (22%) compared with 4/103 (4%) who had not wanted a prescription ($\chi^2 = 17.7$; $P < 0.004$). Of 144 patients who had asked for antibiotics, the doctor considered that patient pressure influenced prescribing in 53 cases (37%) versus 81/628 (13%) for those who had not asked ($\chi^2 = 45$; $P < 0.0001$). Of 205 patients not prescribed antibiotics, only 76 (37%) stated that they had wanted a prescription.

Discussion

This study provides an insight into patients' views and expectations when they consult their general practitioner with acute lower respiratory tract symptoms and the impact those views have on prescribing antibiotics; it highlights some of the problems in the management of this very common condition.

Use of questionnaire

We achieved a high rate of return for questionnaires (78%), but patients who did and did not respond differed somewhat. We do not know if non-responders declined to participate because of dissatisfaction. Reconsultation rates were similar, however, suggesting that this was not a significant factor. A good cross section of general practitioners participated, but the study was not designed to explore variations in prescribing, a subject that we have reported on previously.[1]

We thought it was impractical to issue questionnaires before the patient's consultation because of the difficulties of identifying in advance suitable patients in so many practices. We asked patients to take the questionnaire home before opening the sealed envelope in order to provide confidence that replies would not be seen by their doctor. We emphasised we were interested in their expectations before the consultation and their views on management after consultation. It remains possible that patients' views were influenced by their doctor's action during the index consultation. In previous studies, however, expectation of prescriptions differed little whether questionnaires were administered before[9 10] or after consultations.[11 12]

Our study confirms previous reports that three quarters of patients consulting with acute lower respiratory tract symptoms receive antibiotics, a remarkably consistent finding.[1 2] We studied only previously well patients to exclude those whose symptoms, views, or management may be influenced by underlying lung and other disease.

Most patients think that their symptoms are caused by infection and that antibiotics will help. They want antibiotics and often ask for them. Patients' expectations and requests have a powerful effect on prescribing, even when doctors consider an antibiotic is not indicated.

Table 3 Responses by general practitioners on their certainty about decision whether or not to prescribe antibiotics and whether non-clinical "factors" influenced their decision to prescribe. Values are numbers (percentages of patients) for whom data are available

Detail	Patient prescribed antibiotic (581/787; 74%)	Patient not prescribed antibiotic (206/787; 26%)
Certainty about decision to prescribe an antibiotic (n=787):		
Antibiotic definitely indicated	116 (20)	2 (1)
Antibiotic probably indicated	339 (58)	0
Antibiotic probably not indicated	120 (21)	99 (48)
Antibiotic definitely not indicated	6 (1)	105 (51)
Non-clinical "factors" influenced decision to prescribe antibiotic (n=776)	249 (44)	6 (3)
Specified factors included* (% of this group):		
Patient's expectation or "pressure"	133 (53)	2
Social factors for the patient	66 (27)	0
"My experience is patient will otherwise return"	53 (21)	1
Other factors	45 (18)	4
Work pressure on the doctor	18 (7)	0

*More than one factor present in some cases.

Table 4 Certainty of decision to prescribe antibiotics, when general practitioner thought pressure from patient influenced their decision, for patients who received antibiotics and for whom data are available (n=570). Values are numbers (percentages) of patients

Certainty of decision	No patient pressure recorded by doctor (n=437; 77%)	Patient pressure recorded by doctor (n=133; 23%)
Antibiotic indicated:	395 (91)	50 (37)
Antibiotic definitely indicated	112 (26)	2 (1)
Antibiotic probably indicated	283 (65)	48 (36)
Antibiotic not indicated:	42 (9)	83 (63)
Antibiotic probably not indicated	42 (9)	77 (58)
Antibiotic definitely not indicated	0	6 (5)

Factors affecting prescribing

Non-clinical factors influence the decision to prescribe antibiotics for nearly a half of those receiving one. Patient pressure was cited most frequently, a factor noted in other studies[10 13 14] and identified by the Audit Commission as an important reason for the excess use of antibiotics in the community.[3] Pressure from patients to prescribe antibiotics, particularly for respiratory symptoms, has been identified as the commonest reason for doctors' discomfort with prescribing decisions.[13] General practitioners can, however, overestimate patients' expectations.[15] A quarter of our patients received antibiotics when they stated that before the consultation they had not wanted antibiotics.

During analysis we found no correlation between patients wanting antibiotics or thinking them helpful and the duration of their symptoms or the presence of discoloured sputum, systemic symptoms, or signs on chest examination. This suggests that severity or the "bother" of the illness, at least as indicated by these surrogate markers, does not influence patients' views.

Prescribing decisions by doctors

Doctors' prescribing decisions are complex[1 15-17] and may, as we found, be influenced more by the expectation of reducing reconsultation than by making a definite diagnosis of an infection. Howie found general practitioners used less information when deciding on management than diagnosis and also when deciding to prescribe,[18] suggesting prescribing is the more "thoughtless" and quicker act. This may be counterproductive as inappropriate prescription of antibiotics may encourage the patient to relate the natural recovery of a commonly self limiting lower respiratory

Key messages

- Three quarters of previously well adults consulting with the symptoms of an acute lower respiratory tract illness receive antibiotics even though their general practitioners assess that antibiotics are definitely indicated in only a fifth of such cases
- Most patients think their symptoms are caused by infection, think an antibiotic will help, and want antibiotics; a fifth ask for them
- Patients' expectations and views and doctors' concern that the patient may otherwise reconsult have a powerful effect on doctors' decision to prescribe, even when they consider that an antibiotic is not indicated
- Patients who did not receive an antibiotic that they wanted were more likely to be dissatisfied. Dissatisfied patients reconsulted twice as frequently
- Terms such as chest infection and bronchitis, which imply infection needing antibiotics, are probably unhelpful. Patient education may be more effective in altering the cycle of antibiotic prescription and consultations

tract illness to the effect of medication, engendering a cycle of repeat consultations for minor respiratory symptoms.[19] Prescribing antibiotics for sore throat enhances belief in antibiotics and raises future intentions to consult.[20]

Doctors seem aware of this dilemma and are willing to identify inappropriate use of antibiotics for lower respiratory tract illness. This suggests considerable scope for reducing antibiotic use, which anyway seems of little benefit for acute bronchitis.[21] With no alternative management strategy and when prescribing decisions are made without seeking either markers of infection or specific pathogens, however, antibiotics will probably continue to be prescribed frequently.

Educating general practitioners can reduce antibiotic use[22] and educating patients can reduce reconsultation.[8] The initial investment may prove worthwhile,[17] particularly for a condition for which a quarter of patients reconsult. Patients value time for explanation.[23 24] A few of our patients were dissatisfied with their management, and they reconsulted twice as often. Dissatisfaction was prominent in patients wanting antibiotics but not receiving them, although as a group those given antibiotics were no less likely to reconsult. This suggests that prescribing does not reduce reconsultation and other, more complex factors are involved.[7]

Problems of definitions

The problem of loose and inconsistent definitions has long been recognised in clinical and research practice.[1 25] Abandoning such terms as chest infection, lower respiratory tract infection, and bronchitis, which all imply infection and suggest to patients the need for antibiotics, and developing a more practical label for this symptom complex seems one way forward.

For research purposes and in the absence of known infection in a previously well adult, we suggest using the term acute lower respiratory tract illness, as developed by Monto[6] and used by ourselves[1 8 9] and others,[26] and not lower respiratory tract infection. Perhaps general practitioners may be advised to return to such terms as chesty cough or chest cold to better describe to their patients this common symptom complex, the course of which is probably not influenced by antibiotics.

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