Primary care clinicians’ perceptions of antibiotic resistance: a multi-country qualitative interview study

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Objectives: To explore and compare primary care clinicians’ perceptions of antibiotic resistance in relation to the management of community-acquired lower respiratory tract infection (LRTI) in contrasting European settings.

Methods: Qualitative interview study with 80 primary care clinicians in nine European countries. Data were subjected to a five-stage analytical framework approach (familiarization; developing a thematic framework from the interview questions and the themes emerging from the data; indexing; charting; and mapping to search for interpretations in the data). Preliminary analysis reports were sent to all network facilitators for validation.

Results: Most clinicians stated that antibiotic resistance was not a problem in their practice. Some recommended enhanced feedback about local resistance rates. Northern European respondents generally favoured using the narrowest-spectrum agent, motivated by containing resistance, whereas southern/eastern European respondents were more motivated by maximizing the potential of a rapid treatment effect and so justified empirical use of broad-spectrum antibiotics. Antibiotic treatment failure was ascribed largely to viral aetiology rather than resistant bacteria. Clinicians generally agreed that resistance will become more serious without enhanced antibiotic stewardship or new drug discovery.

Conclusions: If current rates of antibiotic resistance are likely to result in important treatment failures, then provision of local resistance data is likely to enhance clinicians’ sense of importance of the issue. Interventions to enhance the quality of antibiotic prescribing in primary care should address perceptions, particularly in the south and east of Europe, that possible advantages to patients from antibiotic treatment in general, and from newer broad-spectrum compared with narrow-spectrum agents, outweigh disadvantages to patients and society from associated effects on antibiotic resistance.

Keywords: primary healthcare, respiratory tract infections, qualitative research

Introduction

Antibiotic resistance is an international public health problem.1,2 Eighty percent of antibiotics are prescribed in the community, and respiratory tract infections (RTIs) are the main reason for consulting a medical practitioner and prescription of antibiotics.3 The development of bacterial resistance within the community has been linked to antibiotic prescribing for RTIs.4 There is significant variation in the management of community-acquired LRTIs across Europe, but this variation is not driven by clinical need and does not benefit patient outcomes.5 Antibiotics prescribed for acute bronchitis may marginally improve patient outcomes compared with placebo: the results of a systematic review suggest that 14 patients may need to be treated for one to be improved.
(according to clinicians’ global assessment) and that symptoms resolve less than a day sooner in patients who receive antibiotics. The same review found a non-significant trend towards an increase in the number of adverse events in the antibiotic-treated group. However, whether the potential improvement in outcomes in some individuals is justified in the light of the increased risk of adverse effects and of selection pressure for resistant organisms remains controversial. A systematic review and meta-analysis of the risk of development of antibiotic resistance after receiving antibiotics included seven studies with a total of 2605 participants: the pooled odds ratio (OR) of respiratory tract bacteria developing resistance was 2.4 (1.4–3.9) within 2 months of antibiotic treatment and 2.4 (1.3–4.5) within 12 months.

The decision on whether or not to prescribe an antibiotic for LRTI is complex, as the aetiology of the infection is difficult to establish in primary care. Point of care testing and clinicians’ use of enhanced communication skills can help reduce antibiotic use. Point of care tests are now commonly used in primary care in Scandinavian countries as a tool to assist diagnosis, and research has examined their potential use in other European countries. Many factors influence the choice of treatment for patients with LRTI. Purulent, discoloured sputum has traditionally been an indicator to prescribe antibiotics, and clinician factors such as time constraints and maintaining good relationships with patients play a role in decision-making. The class of antibiotic prescribed has an impact on resistance, and patient factors, such as age and the presence of other comorbid conditions, influence whether broad-spectrum antibiotics are prescribed, in addition to influencing whether an antibiotic is prescribed at all.

Although many studies have examined the reasons why clinicians prescribe antibiotics, little is known about European primary care clinicians’ perceptions of antibiotic resistance. Research conducted in Wales and in France indicates that primary care clinicians believe that antibiotic resistance is primarily a problem in hospitals and that it is not a problem in their individual practice. However, it is not clear how widespread such perceptions are, and a deeper understanding of clinicians’ perceptions of the problem may help to explain variations in management of infections across European countries. We chose qualitative research methods because this would allow us to explore clinicians’ beliefs, knowledge and appraisal of antibiotic resistance.

Methods

We conducted a multicentre European qualitative study of the management of acute cough/LRTI and used data from the study to explore clinicians’ beliefs, knowledge and appraisal of antibiotic resistance.

Data collection

Semi-structured interviews were conducted with participating clinicians by a trained interviewer, who in most cases was the NNF, at a location of the clinician’s own choice (usually the clinician’s surgery) between January 2007 and February 2008. The sample size (80) was pre-determined, with the possibility of continuing sampling if data saturation had not been reached. The large sample size allowed variation within and between countries to be examined. An interview topic guide (see Supplementary data available at JAC Online) defined the main topics whilst allowing flexibility to pursue issues in more depth as they emerged from the interviews. Four broad subject areas (factors affecting management of patients with community-acquired LRTI, management of patients with symptoms of community-acquired LRTI, future management of patients with symptoms of LRTI and attitudes to antibiotic resistance) were explored, but this paper reports only data relating to clinicians’ attitudes towards resistance.

The interview topic guide was developed in conjunction with the interviewers and was revised following pilot interviews. Interview topic guides were translated and back-translated to ensure consistency across the networks. The interviewers were from the network area and had varied backgrounds; they included clinicians, research nurses, primary care researchers and a data manager. Interviewers attended a 2 day training workshop in Cardiff to improve interview consistency across all networks. The interviews were audio recorded and subsequently transcribed, anonymized and, in the majority of cases, translated into English by the interviewer. Where translation by the interviewer was not possible, owing to time constraints or limited proficiency in English, a translator was hired.

Analysis

The interviews were analysed in Cardiff using framework analysis. There are five stages of framework analysis: (i) familiarization with the data; (ii) developing a thematic framework through the identification of main topics and subtopics; (iii) indexing (coding the data) into themes (which in our study was assisted through the use of the qualitative data analysis software package NVIVO); (iv) charting by arranging summaries of the data on a case by case basis (which in our study was supported through the use of an Excel spreadsheet); and (v) mapping and interpreting the data by examining the charted data for patterns within and between networks. All data coded at the theme ‘clinicians’ beliefs, knowledge and appraisal of antibiotic resistance’ were extracted and a second, more detailed, analysis was performed by C. P. and F. W. A preliminary analysis was sent to national network facilitators for validation. A written report was produced for each network, with analytical themes and quotations used to support each theme. NNFs commented on the report for their own specific network and attended a workshop with the Cardiff research team to discuss these themes. In this way not only were the themes validated, but the key quotations were checked to ensure that the data had been interpreted in the way the interviewer had understood. There were no disagreements as such, although NNFs did clarify points for us that were then taken into account during the continuation of the analysis.
Results

Nine primary care networks participated, each one from a different European country. Between 6 and 10 clinicians were interviewed from each network (see Table 1). Eighty semi-structured interviews were conducted in total. Clinicians’ gender was balanced overall (41% females), with five networks interviewing more female than male clinicians (Barcelona, Cardiff, Łódź, Milan, Southampton). The mean age of clinicians was 43 years, with a mean of 16 years in practice.

The key themes emerged in line with the topic guide: awareness of antibiotic resistance as a local problem; the influence of antibiotic resistance on clinical practice; perception of the problem on a wider scale (nationally and internationally); and the future of antibiotic resistance. Each theme will be addressed below using data extracts from the transcripts as illustrative examples of the main points, whilst also reflecting views from a range of networks. The code given in the data extracts is the participant’s unique study number.

Awareness of antibiotic resistance as a local problem

All of the clinicians interviewed were aware of antibiotic resistance and most appreciated that it is a significant problem, with many giving the example of methicillin-resistant Staphylococcus aureus (MRSA). Despite this, few clinicians identified antibiotic resistance as a problem in the treatment of respiratory infections in their own medical practice. Most of the clinicians had witnessed antibiotic treatment failure, but they mainly attributed this to either poor patient adherence to antibiotic treatment or the likelihood that the infection was of viral origin (Figure 1, extracts 1, 2 and 3).

Access to laboratory data appeared to influence their awareness of resistance. About half of the clinicians generally agreed that if sputum from patients presenting with symptoms of LRTI were sampled more frequently then they would probably encounter higher levels of antibiotic resistance. Some clinicians reflected that they currently see a lot more reports of antibiotic resistance in urine samples than in samples from the respiratory tract, but then they recognized that they more often requested microbiology analysis when managing urinary tract infections (UTIs). However, they felt that it was impractical to routinely take sputum samples from patients with suspected LRTIs, as the delay before results are obtained is too long for the results to influence treatment (Figure 1, extract 4).

A few clinicians (~5% of the sample) thought that it would be helpful if they could have better access to local resistance data so that they could prescribe the narrowest-spectrum antibiotic that is most likely to be effective (Figure 1, extract 5).

Influence of antibiotic resistance on clinical practice

At least some clinicians from each of the networks reported, on occasions, prescribing broad-spectrum agents rather than narrow-spectrum agents, but the motivation for doing this differed between PCNs. Clinicians from Antwerp, Utrecht and Tromsø were most concerned with preventing resistance. They reported trying, whenever possible, to prescribe narrow-spectrum antibiotics, which are least likely to cause resistance, and believed that broader-spectrum antibiotics should be held in reserve for people who are most at risk (Figure 2, extract 6).

Clinicians from the southern and eastern European networks, such as those in Balatonfüred, Barcelona and Milan, had a different approach and generally stated they would use as first line the antibiotic that was most likely to cure the patient from the outset. Clinicians from these PCNs assumed that most infections are resistant to first-line antibiotics and therefore reported choosing newer, broader-spectrum agents as empirical treatment (Figure 2, extracts 7 and 8).

However, all clinicians from all PCNs stated that reducing the quantity of prescribed antibiotics is an important factor in containing antibiotic resistance.

Perceptions of antibiotic resistance on a wider scale

Clinicians’ perceptions of the extent of the problem in their country varied by network. Most clinicians from Balatonfüred, Barcelona, Milan and Łódź believed that antibiotic resistance is a significant problem in their countries (Figure 3, extract 9).

In contrast, none of the clinicians from the Utrecht-based PCN thought that antibiotic resistance was an important problem for primary care within the Netherlands. Of those clinicians who viewed antibiotic resistance as a problem in their country, most believed that antibiotic resistance is a much bigger problem for secondary rather than for primary care. They reported several reasons for this, including more serious infections with different pathogens compared with primary care, hospital patients being more unwell and sputum cultures taken more often, with resistance therefore more likely to be reported.

The majority of clinicians from the Antwerp, Southampton, Tromsø and Utrecht PCNs believed that antibiotic resistance was a less serious problem in their country than in other parts of Europe, particularly southern Europe. These clinicians stated that antibiotics are more freely available in southern Europe, sometimes without a prescription. Clinicians from networks in northern European countries (Cardiff, Southampton, Antwerp, Tromsø, Utrecht) considered that their antibiotic prescribing...
was restrictive compared with other countries (Figure 3, extracts 10 and 11).

Two clinicians, one from Antwerp and one from Utrecht, also blamed other countries for the spread of resistance within Belgium and the Netherlands, respectively (Figure 3, extract 12).

Other explanations offered for antibiotic resistance included overprescribing for patients with self-limiting infections, self-prescribing of antibiotics by patients, antibiotic use in livestock, using short courses of antibiotics (e.g. 3 days duration) and prescribing by dentists and hospital doctors; in addition, some clinicians from Milan specifically blamed a *Helicobacter pylori* eradication programme for antibiotic resistance within Italy.

**Views about antibiotic resistance in the future**

There were some non PCN-specific differences of opinion about the future of antibiotic resistance. All clinicians thought that the problem would get worse without either increased stewardship generally or new drug discovery. Some felt that prescribing practice needs to change and clinicians must minimize their
antibiotic prescribing and stop prescribing newer antibiotics in order to prevent the problem escalating. Others believed that it is too late for changes in prescribing practice to have an impact on antibiotic resistance and that improving prescribing is just one aspect of the solution. However, clinicians did not always agree on whether newly developed antibiotics would be able to help contain antibiotic resistance. Clinicians from the Antwerp, Cardiff and Southampton networks reported that new antibiotics are not being produced quickly enough, whereas clinicians from the Balatonfüred, Łódz and Milan networks thought that antibiotic resistance was being partly mitigated by the development of new antibiotics. Improved uptake in immunizations was also mentioned as a potential source of hope for the situation to improve (Figure 4, extracts 13 and 14).

Some clinicians commented that older antibiotics (such as doxycycline) that were rarely used in their current practice might now become useful again. Clinician and patient education was thought to be important in decreasing the problem of antibiotic resistance globally (Figure 4, extract 15).

Discussion

Principal findings

This is the first multicentre European qualitative study of clinicians’ views about antibiotic resistance. We found that, although there was variation between the opinions of clinicians both within and between countries, there were also many common perceptions of resistance. Most clinicians reported experiencing antibiotic treatment failure for LRTI, but, because the aetiology is often viral and antibiotics would not be expected to work in such cases, most did not know if these cases had been caused by antibiotic resistance. Clinicians generally reflected that resistance is a bigger problem for the whole country than for their individual practice. However, most clinicians do consider the issue of resistance when prescribing antibiotics for LRTIs. Beliefs varied about the cause and extent of the problem within their country, and differences between the northern European PCNs (Antwerp, Tromsø and Utrecht) and southern/eastern European PCNs (Balatonfüred, Barcelona and Łódz) were most marked on this point. Although views about the future of antibiotic resistance varied, most clinicians agreed that, with no effective interventions (either enhanced antimicrobial stewardship or accelerated new drug discovery), the situation would continue to deteriorate.

Strengths and weaknesses of the study

The sample size of 80 clinicians was large enough to reach data saturation (during our analysis we were satisfied that clear patterns were emerging from the data and including additional respondents was unlikely to yield clearer insights) and allow variation of perceptions to be studied between countries, whilst being small enough that detailed analysis could be carried out fully on each interview. Semi-structured interviews allowed broad uniformity of interview topics between networks while providing some level of flexibility in terms of wording and ordering of questions for interviewers.

Our respondents’ views about antibiotic resistance may be different from the views of other clinicians in their countries as our respondents were recruited from practices that were involved in research and part of a PCN, and they may therefore be more informed about antibiotic resistance. Clinicians who agreed to participate in GRACE may have had a special interest in antibiotics or LRTIs. Social desirability bias may result in clinicians describing their prescribing behaviour as more responsible than it actually is. The risk of this bias may be increased if the clinician knows the interviewer professionally (as happened in a small number of cases in our study) or if the interviewer is known by the clinician to have a clinical background.

Comparison with existing literature

A related, single-centre study of clinicians’ views of antibiotic resistance examined primary care clinicians’ perceptions of antibiotic resistance in Wales. Many participants reported not knowingly experiencing problems of antimicrobial resistance, except in UTI management, and suggested that regular updates about local resistance levels would be useful. These clinicians also had similar views about which patients were more likely to experience problems from antibiotic resistance (e.g. frail, elderly and hospitalized). Antibiotic resistance was more likely to be described as a hospital problem, and half of the clinicians stated that it was not a problem in their practice. A questionnaire study conducted in France by Pulcini et al. found that, although most primary care clinicians felt antibiotic resistance is a national problem, fewer believed that it was a problem in their day-to-day practice. Pulcini’s study also found that primary care clinicians consider that resistance data would be useful to improve their antibiotic prescribing. As these broad perceptions were found in both of the previous studies and in most networks in this study, these perceptions are probably fairly consistent across Europe.

Country-specific resistance data from hospital samples (and therefore not a true reflection of resistance rates in the community) were published by the European Centre for Disease Prevention and Control (ECDC) and show the percentage of Streptococcus pneumoniae samples that were non-susceptible...
to β-lactams, macrolides or both antibiotic classes. According to the ECDC surveillance data, of the nine countries participating in our study, Hungary, Poland and Spain had the highest percentage of non-susceptible isolates to β-lactams and macrolides, both individually and in combination (between 10% and 50% non-susceptible). Data from our qualitative study indicate that clinicians from networks in these countries (Balatonfüred, Łódź, Barcelona) were aware that antibiotic resistance is a problem in their country. It is therefore likely that primary care clinicians' perceptions are a reasonable reflection of true rates. In the ECDC study, between 1% and 5% of isolates from England and Wales were not susceptible to either antibiotic (individually and in combination) whereas Belgium, the Netherlands and Norway all had low levels of non-susceptibility to β-lactams, but 5%–25% of isolates were not susceptible to macrolides.

**Implications for policy and practice**

Some clinicians reported that they would welcome more information on local resistance patterns. The provision of such information could be trialled to determine whether awareness of resistance levels alters prescribing habits. However, as sputum samples from patients with LRTIs are rarely taken in the community, a systematic approach to good-quality sampling and surveillance is needed. Clinicians also believe that prescribing could be improved if they were able to determine whether or not the cause was bacterial. However, prescribing for LRTIs, for example, increases resistance in the bacteria responsible for UTIs, and so the consequences for resistance of prescribing antibiotics for the treatment of LRTIs may primarily be seen in infections in other organ systems. In that study, the effect of all-cause antibiotic prescribing, including prescribing for RTIs, on resistance generally, and in UTIs specifically, was stressed.

This study gives insight into clinicians' perceptions of antibiotic resistance and the findings may help design interventions to decrease antibiotic prescribing. Overall, it shows that most primary care clinicians are aware of antibiotic resistance and aware of the need to restrict antibiotic prescribing but do not see any great urgency regarding the implications for their own practice setting. However, few respiratory samples are currently sent for microbiology susceptibility testing. Increases in such testing and enhanced surveillance in primary care may either provide reassurance that bacterial resistance is not a major problem in LRTI locally in primary care or increase clinicians' awareness of this potential problem. However, as most cases of LRTI do not benefit meaningfully from antibiotic treatment, treatment failure will remain rare. Interventions to enhance the quality of antibiotic prescribing in primary care should also be highlighted.

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**References**

9. Francis N, Butler C, Hood K et al. Effect of using an interactive booklet about childhood respiratory tract infections in primary care consultations...


